The Builder.

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A Colonial Discussion on Art.

A CURIOUS and certainly very interesting document has recently come into our hands. It is no less than an official discussion between the Government of New South Wales and the Colonial Architect, on the question of the real and ideal in sculpture. The subject is interesting enough in itself; it becomes doubly so when raised in relation to work executed in one of those great new dominions in which the English race and the English language have taken root afresh, and where a new English civilisation has sprung up and flourished mightily. It has often been a subject of conjecture with those interested in the progress of art, what further development of the artistic material of the Old World may be looked for among people of the same race as ourselves, who started afresh in another climate and under other surroundings. In general, those who prophesied a new birth of art have been disappointed. American architectural fashions for the most part follow in the wake of English, as far as the artistic side of architecture is concerned. Australian architecture, as far as we get any illustration of it, seems to run also mainly on the old lines. But the incident to which the official correspondence before us refers seems to have given to Colonial æsthetics a little jolt out of the orthodox path, which may have further consequences.

It came to pass that the Colonial Architect, Mr. J. Barnet, who appears to be a gentleman of no ordinary attainments and ability, and who has carried out an immense number of works in the colony, engineering as well as architectural, with great satisfaction to his Government and the public, was in the fulness of time commissioned to design and carry out the new Post Office at Sydney. The building, which is not yet completed, is in the main a dignified and orthodox structure in what we have all agreed to call the Italian style, containing nothing calculated to startle any one. It was on February 22nd, 1882, that a disturbing element was introduced in a letter from the architect to Messrs. M'Credie, the contractors, asking for an estimate for substituting for the ornamental panels in the Pitt-street front a series of bas-reliefs representing "Telegraphy, Professions, Physics, Agriculture, Literature and the Press, Mining and Commerce, Science and Art, the Post Office, and Banking." The contractors undertook to furnish such bas-reliefs, "in best artistic manner by approved artists," for 800*l.*, a sum which does not give a very high idea of the calibre of talent which was to be employed on so many subjects, with "at least two life-size figures" in each spandrel. The idea was "approved," and the estimate accepted. But, alas! the next letter (February 8, 1883) is one from the Postmaster-General to the Secretary for Public Works, headed "Post-Office Reliefs," requesting his hon. colleague to "kindly inform him whether anything has been done towards deciding whether the grotesque carvings on the Pitt-street frontage of the General Post-Office are to remain, or something more presentable to be substituted," as he is "frequently asked" respecting them. After some formal correspondence, the Cabinet appoints five gentlemen as a Board to examine and report, of whom two, for sufficient reasons, declined to act, and the other three were empowered to investigate. They requested photographs of each separate spandrel, to be taken from a stage opposite the work: to which the architect urged that the sculptures were intended to be seen from the ground, and that the point of view suggested was, therefore, not the proper one for giving a correct idea of the work. This appears to have been overruled, and, apparently, the Commission obtained the photographs from their own point of view. This was in December, 1883. On the 15th February, 1884, comes a letter from the Under-Secretary for Public Works to the architect, requesting him to give effect to the Report of the Commission, and, in the first instance, to give a plan of what he proposes to substitute for the carvings when removed. Then follows the Report, dated February 6.

The Commissioners were the Hon. H. C. Dangar, Mr. du Faur, and Mr. W. W. Wardell, the latter a Fellow of the Royal Institute of British Architects and M.Inst.C.E. The Report proceeds to state that the Commission has held several meetings and carefully considered the question. The following are the main paragraphs of the report:—

"We find that the carvings are the result of a design on the part of the Colonial Architect to portray, in realistic fashion, some of the arts, sciences, and customs of this age and country; and that he is satisfied with the manner in which the idea has been carried out.

Whilst we entirely commend the intention of Mr. Barnet in desiring to obtain a durable record of the subjects intended to be illustrated, we cannot but regret the place and manner in which he has sought to perpetuate them.

We consider, in the first place, that they are unsuited in character and design to a building distinguished throughout by much chasteness and excellent execution in other subjects selected for its ornamentation.

These carvings are in high relief, and they consist almost without exception of stiff upright figures. In all pure and good examples, whenever the spandrels of arches are decorated, the subjects are almost invariably in low relief, certainly not more than half relief, and the grouping is generally suggested by the contour of the arch.

Viewed only as fit subjects for the decoration of the Post Office, it is not perhaps a part of our duty to express any opinion as to the success of these carvings as realistic productions; but we cannot refrain from expressing the opinion that they fail to be a true record of the subjects they represent, and that they approach far more to the unnatural and burlesque than they do to the real.

It is only due to a clever sculptor (such as the carvings of the key-stones of these arches prove Signor Sani to be) that we should state we consider he could hardly be expected to satisfactorily realise the difficult subjects submitted to him for execution."

The Commission add that they find that no risk to the stability of the structure will result from the removal of the carvings, and they recommend that this be done, and blocks of stone inserted which may be decorated or not as may be thought desirable. This is followed by a minute from the Secretary of Public Works stating that the Government concur, and that the architect "will take the necessary steps to carry this out."

The architect, however, seems to have had no idea of "knocking under" to this military-like word of command. He replies by a long and very spirited letter, putting his ideas on the subject of what decorative sculpture should be, and telling the authorities very plainly that he considered the opinion of the Commission was a foregone conclusion, they having been appointed to sum up in favour of "the ideal," and that they did not understand what they were talking about. After complaining of the manner in which the photographs were taken, and recapitulating the list of subjects illustrated, the architect continues:—

"As it was not possible to represent all the subjects selected by ideal, allegorical, sham classic figures, lying in unnatural attitudes, on the backs of the arches, in the usual manner of the old masters, I adopted the realistic style or natural manner, treating them as if seen through openings of the spandrels, the various figures being represented as at their usual employments, with the necessary accompaniments; and the result, in my opinion, is admirable, both as to decoration and as illustrative of the customs and costumes of the present day. The superiority of the bold and dashing stroke of the chisel in work which is to be seen at a distance, shows the artist's power of producing a masterly effect of life and reality with a few touches, and is evidence of fine handling. I may here mention that the questions of realism and idealism in art have given rise to a great deal of speculation, which is likely to remain unsettled while the world lasts. Both of these styles are adopted in the Post-office carvings, and they have been used side by side from the time of the Parthenon. Realistic art is at the present time largely in vogue throughout Europe, and specially encouraged at South Kensington;

moreover, it is easily understood by the people generally, which is particularly the case with the Post-office carvings in question.

As to the regret expressed by the Board in its report, respecting the plan and manner in which the idea is being carried out, I think it sufficient to say that the Board admitted to me there was great difference of opinion by the public as to the fitness of these carvings, and their retention or removal, but no mention is made of this fact in the Report.

* * * *

The Board considers that these carvings are unsuited to the character and design of the building, that is to say, they are unfitted, and not in keeping with the architecture. The style of the architecture is Italian Renaissance, examples of which exhibit details and decorations from Gothic on the one hand, to extreme Classic on the other; and of it is said that it not only admits of, but insists on, progress, and knows no guide but common sense; it owns no master but true taste, and more than this, it demands thought, and courts originality,—therefore realistic decorative carvings are not only fitting, but demanded, to show true progress.

The objection that these carvings are in high relief, stiff, &c., and the assertion that all pure and good examples are invariably in low relief, &c., show how unacquainted the Board is with these matters, and how little qualified it is to deal with the subject under consideration; for the contrary is the fact. Spandrel sculpture is invariably in the highest relief; reference need only be made to examples of the old masters in St. Peter's, St. Maria Maggiore, and other churches and buildings in Rome; Santa Maria della Salute, and other churches, as well as numerous palaces, and especially the Ducal Library in Venice, with many other examples, in Italian and other cities. I have already said that these figures are realistic and natural in their pose, which could not be if distorted into positions, as suggested by the Board, to suit the contour of the arch."

The letter proceeds to say that the work could not be cut out without some risk of damage to the building, at least that the operation, to ensure safety, must be a very costly one, and that in justice to himself and the sculptor he considered no further steps should be taken till the building is complete and the scaffolding removed; and that then photographs of the whole of the building, showing the general effect of the carvings and decorative work, should be taken, and submitted for the opinion of the best authorities on modern decorative carving in England, Paris, Milan, and Rome, adding that it was doubtful whether competent and independent opinion on works of this kind could be obtained in the colonies.

The nature of the attempt which has thus been made to give realistic interest to architectural sculpture may be partially gathered from the architect's description of the intention of some of the subjects:—

"*Telegraphy* is represented by an operator at work, with his right hand on the instrument, while reading a telegram. On the lower part of the spandrel is a little boy trying to prepare a battery. At a counter a young woman with a pleasant look, writing a message, and, in the distance, a mounted messenger, conveying telegrams.

Banking is illustrated by a Bank clerk paying money over a counter to a young woman who is presenting a draft. In the lower corner of the spandrel is a little boy with money in a bag, and crying because he has lost some of it while bringing it to the bank.

Post Office Business.—This is represented by a letter-carrier, heavily laden, as on a mail day, giving to a young woman a letter, which she gladly receives. Below is a little girl reading a letter."

We have before us two sets of photographs of the portions of the buildings in which the sculpture is included, sufficient to give a very good idea of them, but not sufficiently large or clear (owing to the figures being partly in shadow) to be adequately reproduced in our illustration pages by the process we usually employ for reproducing sculpture. Taking the general question of the view of the subject as put by Mr. Barnet in the quotation from his letter, we should say that they do appear very incongruous in the position in which they are placed, owing to their juxtaposition with decidedly Classic detail, with which they do not harmonise either in spirit or in line; besides which, although showing a certain dash and cleverness, they are vulgar in conception. Between these very realistic sculptures, are large Classic capitals on the Jupiter Stator model, alternating with large consoles carved with ideal heads in a very different style from the spandrel figures, and about three times the scale. The spandrel figures appear in fact, as what they actually were,—an afterthought. The architect has taken well-known Classic models for the adjoining architectural details, and interpolated between them work which appears to come from another world of art entirely. It appears to us that if the attempt be made to do anything so original, and what may be called anti-Classic, as these sculptures, the same spirit of movement and originality should have pervaded the architectural framework. The instance of the Parthenon is hardly to the point. There is no doubt that the frieze of the Parthenon is realistic as compared with the metopes and the tympanum sculptures, but there is no such clashing of different elements as in this case. The figures may represent nearly the actual figures of the procession, but their arrangement is highly conventionalised, and they are in low relief. Beyond this there comes the question whether this realistic method of representing various arts or professions is really the best or the most artistic. That it is most easily "understanded of the people" may be granted. But a higher and more intellectual form of sculptural art is that which would convey, not the realistic accidents of dress and circumstance, but the abstract symbolising of the essential and central idea. Thus, a sculptor or a painter who was also something of a poet would be able to represent, through an abstract figure, the idea of the electric telegraph apart from the unimportant incidents of the frock-coat and cravat of the operator. It is very difficult to do this effectively and intelligibly; but a sculptor who could do so would evince higher powers than one who merely modelled a portrait figure in every-day dress. The uneducated public would understand the latter treatment better, no doubt; but the uneducated public are not the best judges of so intellectual an art as sculpture. As a typical instance, take Carpeaux' celebrated group, "The Dance," on the façade of the Paris Opera House. Here the idea of the excitement and *abandon* of the dance is splendidly conveyed in figures which represent no special period or country, but are the abstract and poetic expression of human feeling and action. Can any one possibly maintain that this subject would have been of more interest if treated, with whatever ability, as a representation of the waltz danced by figures in swallow-tail coats and costumes by Worth? None but children and simpletons could think so. Nor, again, is it anything to the purpose to say that many bad and ludicrous quasi-Classic allegorical figures are to be found, as in many of the monuments in St. Paul's (which are cited by Mr. Barnet as terrible warnings). Symbolic sculpture requires very high powers for its successful treatment, and accordingly it has often been unsuccessfully treated; but that is no proof that the aim in itself is a mistaken one. Then, to come to the actual work which has given rise to this discussion, we fear we must coincide with the members of the Commission in concluding that it is not at all good as realistic work. It is, in fact, not sculpture, but stone-cutting. The expressions of the faces are exaggerated,—in one or two instances to a grotesque extent,—and the figures appeal rather to the interests of children than of grown-up persons of education.

The attempt, however, was a spirited one, and may lead to something better; and we are glad to find, from the concluding documents of the State paper in question, that the Government, on the recommendation of the Postmaster, finally consented to leave the sculptures untouched until the building is complete and the scaffold removed, and their result as a portion of the whole fairly considered. We should be inclined to think that, being executed, they should not be removed. They will form a record of a well-meant, though not very successful, attempt to give more than merely conventional interest to the sculptural decoration of a building, and the best lesson to be drawn from the incident would be to endeavour to do the thing better and more artistically at the next opportunity, and, if possible, to obtain the assistance of a sculptor of higher powers. We may perhaps be pardoned for adding the suggestion that there are more clever young sculptors in this country at present than can find room for a profitable disposal of their works, and that, perhaps, mutual benefit might ensue if the Government of New South Wales could offer some of them congenial employment in the new country.

THE PREVENTION OF WASTE OF WATER.

IN circumstances where the consumption of water has reached the limit of supply, a means for the prevention of waste becomes at once the most important of all items. The possibility of increasing the dimensions of tunnels or other forms of aqueduct that may exist cannot be entertained, as the time required for such alterations is not frequently at the disposal of the engineer. The evils attending an intermittent supply are too well known to require enlarging on here. In the construction of reservoirs, provision is always made for the periodic closing of the aqueduct for purposes of examination and repair; but not usually for their ultimate enlargement. It is not considered necessary to anticipate a period of more than thirty years in making provision for the probable demands of the future. When that has been done, little more can be expected. The time comes for the consideration of a means for obtaining an increased supply. In order to obviate the expense of new works on the one hand, and intermittent supply upon the other, a careful analysis of the sources of waste has led to the perfecting of a system, not less interesting than complete, which, by careful working, has obtained in Glasgow and elsewhere excellent results. In an article upon the Glasgow Corporation Water-works, which appeared in our issue of the 13th of June of this year, we state the result obtained in the following terms:—"The saving of water in this way has averaged 13 gallons per head; but, taking it at 10 gallons, the saving over the whole city would be 7½ million gallons per day, or about one-fifth of the whole water supply, and at an expenditure of one-third of the capital represented by this saving." We now propose to put the details of this system before our readers.

Waste, as the word will be frequently used in the context, must not be understood as referring to extravagance in the use of water; but as applying only to the water lost in consequence of defects in distributing and service pipes and bad fittings. The quality of the distributing pipes is supposed to be insured by the water company specifying, and superintending the making and testing of them. But blown joints and splits will occur, and in ways not always capable of explanation; but usually from local subsidence of the pipe-track. If the water does not rise to the surface, it finds its way into the street sewers; and the presence of such a defect is discovered by want of pressure in the locality; but, as it affects a large area, it was long found difficult to localise it sufficiently to discover its exact whereabouts, until the system subsequently described was introduced. It may be remarked in this connexion, that in Glasgow, before the waste-water meter system had reached its present stage of development, cases occurred where leaks from 3-in. and 4-in. pipes had carried away sufficient material to bring about the falling in of a street. In one case, five cart-loads of material were required to fill up the cavity. How long this leak had been going on could not be ascertained. In regard to service-pipes, as they are situated for the most part underground, except where the water rises to the surface, a burst is discovered by want of pressure on the property supplied. Of the complaints of want of water made by householders, 30 per cent. is not an uncommon average to find due entirely to the bursting of lead service-pipes. Of course this must not always be attributed to lightness or bad material. These can be discovered by inspectors from the water company, who

insist upon examining them before they are covered up, but splits may and often do occur on the inside of the pipe during manufacture which causes them to give way before a high pressure of water. Service-pipes must always be provided with stop-cocks at 2 ft. from where they leave the main, and about 2 ft. 6 in. below the surface of the ground. Where service-pipes are exposed they must be protected from frost, and with that object it is recommended that they be placed a short distance from the outside wall.

Of the waste due to the use of defective water-fittings much may be said. Unless it becomes a source of annoyance to the occupants of a house, either in the form of noise or escape in undesired places, it may go on for a long period of time without being discovered by the officers of the water company. This waste, not being confined to one house or half a dozen, but extending over whole streets, becomes, therefore, a very serious matter. It is necessary that the water company have powers to compel the removal of imperfect fittings. In Glasgow, Liverpool, Manchester, and Dublin, all new fittings which have not previously been tested and stamped with the Company's mark are rejected. The process of testing consists in subjecting the cocks to three times the highest pressure they will have to resist when in use, for which trouble a small fee is charged. This has led to the rejection of almost every cock which is not constructed on the screw-down principle. The testing pressure is 300 lb. per square inch for cocks supplied direct from the main, 150 lb. for ball-cocks to cisterns, and 25 lb. for lavatory and other fittings supplied from cisterns. In 1877, when the system of testing was introduced in Glasgow, 14·60 per cent. of the fittings submitted were rejected, and in 1880 only 3·92 per cent. were disallowed. As a result of the careful supervision which formed part of the system, such an improvement in the manufacture of fittings, effected within three years, showed pretty conclusively that some such protection was one of the most practical of the requirements upon the programme of reforms to be carried out. Water-closet cisterns are examined by the inspectors as soon as they are placed in position. They may give a flush of from 1½ gallon to 2 gallons, but not more, and this flush must take place within three or four seconds after lifting the handle. Fittings which are found wasting water twice within three months are removed, and are not allowed to be fitted up again in any position. Before leaving the question of fittings it may here be observed with advantage that, in spite of the exercise of every precaution and economy, increased consumption per head invariably follows improved or altered domestic arrangements. The quantity of water used per head in every important manufacturing centre is constantly upon the increase: and in one sense so much the better. If we consider the average consumption per head over districts which consist for the most part of three kinds of property, taking the night-rate as the standard in every instance, we shall then obtain some idea of the extent to which improved domestic and other arrangements affect the consumption of water. In the case of property consisting of houses with a rental averaging 6*l*., the consumption per head per twenty-four hours was 4½ gallons; of property where the houses were about 18*l*. rental, and a large number of shops with a rental varying from 30*l*. to 100*l*., the consumption was 16 gallons; and in the case of high-class houses, with a rental of from 80*l*. to 300*l*., the consumption was 48 gallons per head.

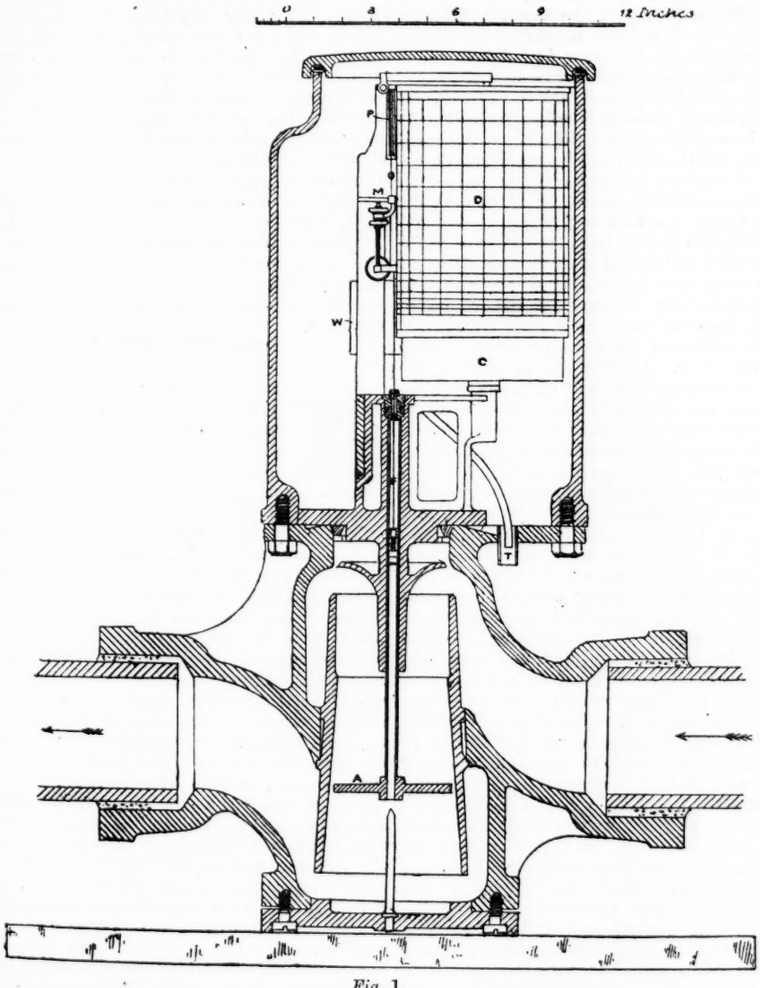

Fig. 1.

A. Brass Disc equal in diam. to top of Cone.
C. Lever Clock.
D. Drum revolving once in 24 hours, and carrying the diagram paper.
F. Hard brass wire connecting Disc to Pencil-carriage.
M. Metallic Pencil and Carriage.
O. Metallic Cord.
P. Pulley.
T. Waste Tube.
W. Weight pulling Disc to top of Cone.

Of the methods which have been in use in Glasgow for the detection and prevention of waste, the oldest is house-to-house inspection. A town is divided into districts, and one of these is allocated to each inspector. It is his business to examine all the fittings in each house regularly, and report any waste that may be going on. A notice is thereupon sent from the office of the water company requiring the repair to be executed within a given time, usually six days. At the expiration of that time, if the repair has not been done, the water is thereupon shut off, which proceeding invariably proves an effectual appeal to the parties concerned. When the stop-cock closed supplies several parties, it would appear somewhat arbitrary to make the unoffending suffer for the negligent; but, it need not be added that this fact is in itself an additional guarantee that the repair will be executed without further delay. The system of house-to-house inspection is very satisfactory so far as it goes, and is a means of preventing a considerable waste of water. It may be at once seen how satisfactory it has proved by the remark that in Glasgow an addition of four inspectors was the means of saving per day 800,000 gallons of water; or, in other words, after such increase of the staff, the average consumption of water per day was 800,000 gallons less than during the previous year. It will be obvious, however, that where equal operations are being carried on in every district, there is a great loss of power, as a large percentage of the waste going on may be confined to one district. This eventuality is effectually met by the use of waste-water meters, which indicate very clearly, by means of diagrams, where the consumption is beyond the average; and in this way, the day inspectors are enabled to devote their whole energies to those districts where it is known that serious waste is really going on. The meter for this purpose in common use is Deacon's Differentiating Waste-water Meter, a sketch of which is given, fig. 1. The sketch will explain itself. The whole meter, except the outside case and the clock-springs, is of brass. As a consequence of the fewness of its working parts, the possibilities of wear and tear are not great. Experience has gone to show that ten years of constant use does not even suggest their disconnexion from the main. At the end of that time they have been found in as good repair, practically, as when they were first put down. The only two parts which give any trouble are the clocks and the pulley-wires, which are of comparatively little moment, as they may be adjusted within a very short space of time. But it happens occasionally that the wire breaks or the clock stops, and this may occur when a night inspection is being taken. In that case, of course, no night inspection diagram can be obtained. It would not affect the subsequent day inspections, but it would affect the report, where the extent of the results obtained from such inspections could not in consequence be stated. The possibility of the wire breaking is one which cannot very well be provided against; but the matter of the clocks stopping may be attributed to various causes, the principal of which is perhaps the very nice adjustment which they require. In fig. 1 the clock is shown at C., the upper half of which is hidden, as it passes into the drum upon which the diagram is attached. Whatever is done with regard to other departments, it is imperative that the matter of the clocks and other details connected with the meter be put into the hands of a conscientious mechanic who is thoroughly familiar with his trade. Otherwise, from the two causes above detailed, annoyance to the engineer is not likely to be an unfrequent occurrence. The trial of these meters in Glasgow was very encouraging. The first night inspection being taken, and repairs accomplished, it was found that the consumption of water fell from 65½ to 41 gallons per head per day, and the rate from 1 a.m. to 5 a.m. from 57 to 31 gallons per head. On the strength of this result a much larger area was experimented upon, when the results continuing to be satisfactory, Mr. Gale, the engineer, advised the extension of the system, until now 77 meters have been laid down.

When it has been decided to put a new

district umder the water-waste meter system, the following is the manner of proceeding:—A skeleton tracing is made, showing all the pipes within the proposed area to be put under. An approximate estimate of the number of people supplied off each pipe is obtained from the surveyor's books, and noted in each case upon the tracing. It is then easy to determine the sub-districts, always taking into consideration the public works supplied by ordinary meter, so that the consumption through a water-waste meter shall not exceed the limit of its indicative capacity,—viz., 10,000 gallons,—at any one time. As a matter of fact, in Glasgow, the trade consumption in some districts is so uncertain as to bring the pencil up to and run it along the 10,000 line; and, in consequence, a correct day diagram cannot always be plotted. In such cases, the night rate must be depended upon. In a few instances, the alteration of piping necessary is considerable; but in many cases it amounts to very little more than altering the position of cleansing cocks and valves. Drawings to a larger scale are then made of the parts where alterations have to be carried out, and these are put into the hands of the manager of the pipe-layers. While the work is being done, and the meters placed in position, day inspectors are engaged in taking a careful census of each sub-district, and, at the same time, other day inspectors are at work obtaining the position of every stop-cock in the district, and the nature of the property or properties supplied off each. The description of property as detailed in the census-book is compared with that given in the stop-cock book, by a clerk in the office, and in that way an insurance is obtained against the possibility of any omissions in either. Every case of a stop-cock in bad repair is carefully noted and reported at the office, where orders are immediately given to repair it. In that way, the night inspectors are enabled to get over the district upon which they are making an inspection without delay. In a new district, it is usual to take a series of one-day diagrams before proceeding to make a night inspection, and in this way obtain an idea of the consumption per head before serious operations are commenced. When a diagram is put upon a meter, the *intermediate* valve is closed, and the *meter* valve opened (see fig. 2). As the meters

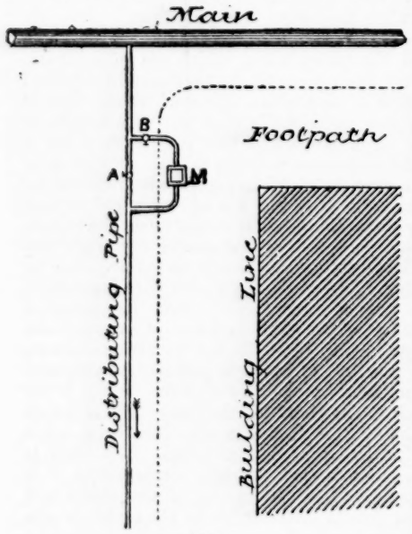

Fig. 2.

A. Intermediate Valve.
B. Meter Valve.
M. Meter.

used are all 4-in., it is clear that when they are placed upon larger mains than 4-in. the intermediate valve being closed, and all the water having in consequence to pass through the meter, a considerable want of pressure would be felt in case of fire. To obviate this, the manager of the fire-brigade is furnished regularly with the date when a meter is to be in use; and, as he is also carefully informed as to the exact position of every *intermediate*, in the emergency of fire, he has only to open the valve, when he at once obtains his full pressure.

The most important part of the whole system is centred in the night inspection. A diagram is put upon the meter four or five hours before the night inspectors commence work. A few minutes before 1 a.m. the two night men are upon the ground ready to begin their round. They first sound all the meter valves and meter stop-cocks in the district. If the works or shops supplied through these meters are not working overtime, and the valve or stop-cock, as the case may be, is heard to sound when the key is placed upon it, it is noted whether it sounds when open or when shut, and the nature of the noise as simple, loud, or extra loud. The inspector takes a note of the time, which he also enters into his book. This book is made out in the office by a clerk immediately a night inspection has been decided upon by the engineer, and then put into the night inspector's hands, when all he has to do is to go to the properties in the order in which they are written, and enter in the space allowed for each the particulars of his observation. When this is compared with the diagram upon the following day, the defect, if serious, is immediately recognised, the effect of opening and closing being clearly defined. If water is found passing, whether for legitimate use or in the form of waste, the valve or stop-cock is closed, and the cover lifted, and placed on one side. It might be supposed that in the former case inconvenience would be caused to the works, shops, or others deprived of water, but it is understood that these places have tanks always filled which will enable them to go on for at least four hours should the water be withdrawn either during the day or night, Notice, however, is given if such withdrawal is to be continued for a longer space of time than one hour. If no water is passing, the valve or stop-cock is left open. The same operations are next gone through with all the stop-cocks supplying domestic dwellings, and in each case, where found sounding, the cover is lifted and placed on one side. In some cases where waste is going on, no sound is heard when the stop-cock is full open, but, on gently closing it, the increased velocity of water through it gives rise to a distinct sound. It requires a practised ear to make a perfect inspection, as many sounds indicative of waste are not recognised by those unaccustomed to the work. Having sounded all the stop-cocks in a district, and shut those found sounding, an interval of half an hour is allowed to elapse before opening operations are commenced. The object of lifting the cover and leaving it on one side is to show at once where a stop-cock has been closed, and in that way save time. The inspector then makes up a list of his observations, which is put into the hands of a clerk at the office, who fills up a printed form for every property the stop-cock for which was found sounding. These are handed to the day-inspectors, who proceed to examine the premises. If several stop-cocks near one another are discovered by the day-inspector to sound when shut, he notes the loudest of them, and in that way determines the position of the waste going on, which in almost every such instance is taking place between the main and the stop-cock. If he finds that when a particular stop-cock is closed, the others cease to sound, then he presumes that the waste is going on from the service-pipe after it has passed that stop-cock. By the simple process of syphoning, he decides at once if it is taking place underground. Syphoning consists in shutting the particular stop-cock, and proceeding to the tap in the ground-floor house, first assuring himself, if there is a cellar or underground place provided with a crane, that this is securely closed. By placing the tap in water and turning it on, the suction caused by a vacuum created in the pipe in consequence of the water passing away through a defect underground, shows clearly that it is between that tap and the stop-cock; and its position may be accurately calculated by a man who is thoroughly familiar with his work, by the time taken by the air to fill up the vacuum thus created.

When a district meter has been got into working order and the waste reduced to a minimum by three or four night inspections, the one-day diagram is discontinued, and a three-day diagram is substituted. This latter is put on every meter in use once during each month in order that a monthly report showing the condition of all the districts may be made out. In this way an average of the consumption for each meter is arrived at, and, when it rises much above that average, a night inspection is ordered. The diagrams are calculated and plotted into a book, which shows at a glance what improvement has taken place after a night inspection, and which district requires to have a night inspection made. More reliance, as it has been previously stated, is placed upon the night rate, taking it from 1 A.M. to 5 A.M., especially where much water is used for trade purposes.

Out of fifty districts, with an average population of 1,637 persons, the cost for rearranging the pipes in order to isolate each district, including the fixing of the meter, was about 37*l.*; for repairing the stop-cock boxes, 21*l.*; for the preliminary inspections to bring the districts to working order, 13*l.*; and the meters themselves costing 29*l.* each, making up a total of 100*l.* per district. The above is the cost for laying out a district, but the cost of working the whole seventy-seven districts, omitting, of course, the salaries of the day inspectors who would be employed in any case, reaches the figure of 300*l.*; 132*l.* representing the salaries of two night inspectors, 132*l.* for two men who attend to the clocks and diagrams, 26*l.* for the time occupied by a draughtsman in reducing and plotting the diagrams; and 10*l.* for incidental expenses.

NOTES.

WHATEVER may be our shortcomings with regard to the housing of the poor, other Continental countries are not blameless in this respect. The latest Embassy and Legation Report, just published, gives a melancholy account of the condition of some of the Italian labourers, both urban and rural, and particularly in Rome and that extensive and unhealthy fringe of coast known as the Campagna. In ancient times this district contained many of the rich and prosperous Roman cities, whereas now it is a picture of malarious desolation, having but 12,734 inhabitants, for whose accommodation there are only 556 houses. The greater number of the labourers in the Campagna are strangers from other districts, who for the eight months of their sojourn dwell in huts or wigwams, of which there are 469; the remainder live in caves and grottoes, or in the ruins of ancient buildings and tombs, while many have no roof but the heavens, and no bed but the grass. In almost every part of the whole district, the scarcity of houses in proportion to the number of labourers is startling and well nigh incredible. In one commune there are 456 houses to 3,127 persons, in another 316 to 1,604 inhabitants, and in a third, 704 peasants without a single dwelling. To render the anomaly more striking, there are places which contain many uninhabited houses, which have been purposely unroofed to avoid the heavy house tax. Indeed, a wealthy proprietor near Rome, the Prince Torlonia, has numerous farm buildings unroofed and going to decay, while the labourers on the estate are living in wretched hovels, or in holes cut in the tufa rock. Those English politicians who are so enamoured of the proposal to make peasant holdings, will be interested in learning that there are in the province of Rome no less than 122,633 peasant proprietors, whose individual holdings are less than 2½ acres in size. The result is, that those who labour expend their entire force in tilling the ground, while those who do not manually labour soon lose their property. More than half of the workers are attacked annually by sickness, and no wonder, when we find that maize, vegetables, and thin cheese, all of very inferior quality, are their chief and often their sole food, while the water is usually bad and scarce. In the city of Rome itself, the conditions are almost as unhygienic. Many rooms

are below the level of the street, and never get a ray of that sunshine of which the Italian proverb says, "Dove entra il sole, non entra medico," or, in other words, "No doctor wanted where there is plenty of light and air." The smallest apartments are occupied by ten, fifteen, or twenty persons, and under these circumstances, four cubic yards of air is all that can be relied on per head. Consumption, fever, and immorality are the natural sequences. A single speculator recently built in a central and populous part of Rome no less than fifty mud hovels, 7 ft. high by 9 ft. wide, in each of which four or five persons were huddled for warmth and shelter. It is true that a society exists for the improvement of the dwellings of the poor, but it is not well supported and its means are quite inadequate.

THE strike at the Elswick Works, which has been fortunately terminated by the common sense of the majority of the men, would, if persisted in, have been a serious menace to the material efficiency of English manufactures. Apart from the broad questions of, first, the justice, and secondly, the wisdom, of this unhappy method of fighting out questions of the rate of pay, there were special features in the present case which would have rendered submission on the part of the masters a suicidal act. Let us for a moment assume that the managers against whom the movement was directed were men unfit for their posts. Proof of such unfitness must then be readily attainable; and if such proof were submitted to the directors in a quiet and business-like manner, the result could hardly be doubtful. But to be reduced, when asked to state causes for a personal objection, to so vague and sentimental a complaint as that of "the introduction of an unkindly and domineering spirit," is to admit that there is no case for the complainants. Every one who has had the management of large bodies of men is aware of the fact that the qualities in the foremen and managers which are necessary to insure business success, and which thus conduce to the permanent welfare of the whole industrial community, are very rarely combined with great suavity of manner. The more the good foreman identifies himself with the excellence of the workmanship and the cheapness of the out-put of a factory the more intolerant is he, naturally, of idleness, insubordination, and all those qualities on which the misleaders of the working classes found their appeal to the passions, rather than to the good sense, of their auditors. To give up a foreman, even if a somewhat harsh and dictatorial one, at the bidding of the men working under him, without trial or even distinct accusation, would be to invert the relations of labour and of capital, to the ruin and downfall of both. Of that the employers, as a rule, are fully aware.

PROFESSOR L. LEVI endeavoured to persuade the section of the British Association that deals with economic science and statistics that there was nothing new in the occurrence of even a somewhat protracted depression of trade. He admitted, however, that the general condition of trade was certainly considerably altered, and was much more precarious than it was fifteen or twenty years ago. He held that Royal Commissions could not improve trade, and prophesied that that "summoned, if possible, to reverse the verdict of the nation as to free trade would, like Balak of old, not only reject the appeal, but confirm it as irrevocable." (We conclude that the error as to the personage cited must be that of the reporter.) What Professor Levi omitted to mention was the prodigious change which has occurred during the last forty years, in the relative prices of each average ton of imports into, and exports from, the United Kingdom, as measured by the ton of cargo-carrying shipping. During the decade 1840-49 we paid 16·8*l.* for every ton of imports, and received 16·9*l.* for every ton of exports. During the decade 1870-79, we paid 18·7*l.* for every ton of imports, and received 12·7*l.* for every ton of exports. This shows a depreciation of 24·8 per cent. in the price of exports, and an increase of 11·3 per cent. in the price of imports. An acknowledgment and an explanation of this unfavourable statistical fact would have been better worth the attention of the section than confident predictions as to what the Royal Commission on the Depression of Trade will or will not do.

THE dispute between Mr. Whitworth, M.P., and the Chairman and Directors of the Metropolitan Railway is one which has some public interest, for the efficient working of this line affects the comfort and convenience of most dwellers in the metropolis in a less or greater degree. Into the merits of the dispute between Mr. Whitworth and his co-Directors the public have not yet been admitted, but certainly, for the interests of the shareholders, the sooner both parties lay their cases before this body the better, for no Company can be regarded as in a satisfactory position when a director retires and makes grave charges against the management of the Company. It is to be hoped that the dispute may, at any rate, help to bring about, sooner or later, some kind of working arrangement with the District Company and likewise put an end to any more extension schemes, such as the absurd proposed pushing of the Metropolitan Railway into the agricultural county of Bucks. The object of the Metropolitan Railway should be to serve the metropolis as efficiently as possible, not to seek speculative advantages in the country. The line is overweighted with traffic as it is.

AMONG the more reasonable and sensible resolutions passed at the Trades' Union Congress was one urging the Legislature to confer power upon the Board of Trade to compel the adoption of an improved system of coupling for railway vehicles, such as will render it unnecessary to pass between them in coupling and uncoupling them. We have before adverted to the subject, and considering that there are a number of inventions for this purpose, two or three of which at least are practicable and not costly, it becomes a matter of absolute and wilful wrong to continue the present dangerous and murderous system. The percentage of injuries and deaths to railway servants from accidents in coupling during shunting is an appalling one, and the railway companies ought to be compelled to give the matter their attention without delay.

WE hope that the decision given by Mr. Bridge in a case under the Metropolitan Building Act, as reported in another column, will have the effect of inducing the Board of Works to reconsider their conservative and obstructive position in regard to the employment of concrete as a building material. The defendant was summoned for using concrete for the walls of a block of artisans' dwellings, having been previously served with a notice to discontinue it. The defendant said, "under advice," he should proceed with the building. The Magistrate ruled that concrete, properly constructed (and there appeared to be no contention that this was not so), was a good material for building purposes, and dismissed the summons. Concrete building was introduced since the Act was passed, and the Board of Works apparently "cannot find it—'tis not in the bond." It is absurd at this time of day that special licence should be required for using concrete walls. The Board should confine their action to seeing that the concrete is properly made and of the proper materials; they will then be doing valuable work. To put concrete building under an official ban is what cannot reasonably be allowed any longer; and the Magistrate's decision was in accordance with common sense.

"A FEW of the unpleasantest words that ever blotted paper," in a scientific point of view, are to be found in the opening address of Mr. Baker, the President of the Mechanical Science Section of the British Association, and the worst of it is that the subject is one on which the speaker is probably the highest living authority. "Hundreds of existing railway bridges," said Mr. Baker, "which carried twenty trains a day with safety, would break down quickly under twenty trains an hour." With a growth of traffic which, on prosperous railways, exceeds 3 per cent. per annum, year after year, this announcement is very ominous. As a result both of his own investigations and of communications with leading Continental and American engineers, as to the admissible intensity of stress on iron and steel bridges, Mr. Baker declared that "at the present time absolute chaos prevailed." He could cite cases, he added, where the working stress on the iron had exceeded, by 250 per cent., that considered admissible by German and American engineers. A bridge that would be passed by the Board of Trade would require to be strengthened by from 5 to 60 per cent. before it would be accepted by the German Government, or by any of the leading companies in America. In that state of things passengers may be comforted by being told that the large railway companies are strengthening their iron bridges, but the prospect is less cheering for the shareholders.

IN the last number of the *Statist* there is a retrospective account of the condition of Welsh railways, which will be of melancholy interest to all those who love the Principality. There are the two great trunk lines, which have appropriated a considerable portion of both North and South Wales, viz., the London and North Western and the Great Western, to which, of course, the remarks do not apply; but they are the chief cause of the unproductiveness of the Welsh lines proper, as they have secured for themselves the most valuable portions of the country, leaving the dry bones of the remaining districts to their unfortunate competitors. The consequence of this one-sided division is that there are at least twenty-one different railways of greater or less length which are almost entirely non-dividend paying. The invested capital is nearly 14 millions sterling, of which over 4 millions are in ordinary shares and 5 millions in preference stock. But one line, and that a very small one, running from Ruthin to Cerrig-y-druidion, is earning anything on the ordinary shares, this solitary exception being at the magnificent rate of 1½, while, in the case of preference stock, there are about half a dozen lines which do a little more than pay their way. These, however, are only where special manufacturing advantages are to be found, as, for instance, the Brecon and Merthyr, which has an iron and coal traffic to and from the iron works of Dowlais and Merthyr Tydvil, and which earns a dividend of 5, as also does the Swansea and Mumbles, a very short line with a watering-place traffic. The Pembroke and Tenby is a similar line, although it only earns from 2 to 3. The Cambrian, Central Wales, and Mid Wales are the only systems which can be considered trunks, and were it not for these, a large proportion of the Principality might as well be in the American backwoods, as far as accessibility goes. They all run through more or less barren districts, in which populous towns are few and far between. In the summer months, they obtain a fair share of tourist and seaside passengers, but once the season is over, empty carriages are the rule. The only apparent way of improving this doleful property, is for the Welsh railways (which, after all, only amount to 854 miles) to amalgamate. This would have a good effect in two ways. First, a united concern of this magnitude would be able to meet the two big companies with something like a bold front; and secondly, the enormous expenses of so many divided managements would be saved. This is no light matter, seeing that, at present, these separate companies have 184 directors and 101 principal officials for 584 miles, whereas the Great Western Railway, with 2,286 mileage, has only nineteen directors and eighteen chief officials.

AT the last meeting of the Archæological Society of Berlin Dr. Fürtwaengler read a paper on the recent excavations of Mr. Ohnefalsch-Richter in Cyprus. A sanctuary of Aphrodite, "Idalian Aphrodite beautiful"

has been laid bare at Dali (ancient Idalium). A great number of votive images of the goddess have been found, and the series represents successive phases of Cyprian art. Some are of the Egypto-Phœnician style, some purely Egyptian, others archaic Greek. This is only fresh witness to the receptive, imitative nature of the Phœnician artist. We have almost ceased to look for work that shall bear the impress of his individual hand. All we now hope for is to make out more clearly the chronology of his apt pupillage. A quantity of archaic pottery was found with the figurines. Details of the excavation will probably appear in the *Mittheilungen* of the German Institute at Athens.

AT the School of Art Wood-carving (which is now established in its new quarters in the City and Guilds Technical Institute in Exhibition-road) there is on view for the next few days a large carved mantel and over-mantel which has been executed by the pupils of the school for the library of Ingestre Hall, the seat of Lord Shrewsbury. The practical work has been done by Mr. Upham, the artistic work (panels, terminal figures, and ornaments) having been executed (under supervision) by the members of the school. It is a good piece of work, and should lead to the school obtaining other work of the kind from architects. The school is under the immediate supervision of Miss Rowe, and includes pupils of both sexes. The effort is made to give individuality of style and feeling to the work, and to avoid mere routine and mechanical style. Instruction is also carried on by letter with pupils in the country, who receive roughly-shaped pieces of wood, sent by post, to work on, accompanied by drawings and description of the manner of working; these are sent back usually at an intermediate stage for criticism, and then returned for completion. The number of pupils has been steadily though slowly increasing since the school was started in rooms at the Albert Hall five or six years ago. It deserves the support and attention of architects.

PAUSANIAS, walking through the precincts of the sacred Altis at Olympia, saw, he tells us, a statue of "Sophius, a Messenian boy," who "vanquished boys in the course." Dr. Purgold has just given back to us, not the statue,—that, probably of bronze, has perished,—but the very base of the statue, with the name and country of Sophius. The Altis is fast getting repeopled with its ancient throng of stone inhabitants. If many more of these inscribed bases still lie undiscovered we may, indeed, be glad that the Greek Government is about to resume the unfinished German excavations.

AS the many holiday-makers return to town they will, when they visit Piccadilly-circus, rub their eyes like so many Rip Van Winkles. There has probably been no recent metropolitan improvement which makes itself felt more vividly than the demolition of the block of houses which stood at the junction of Regent-street, Piccadilly, and Coventry-street. The sudden appearance, so to say, of the decidedly striking building into which the rather disreputable-looking London Pavilion has been turned, aids considerably in making the improvement very obvious. When the plot in the centre has been laid out with grass and flowers, and with, we may hope, a well-designed fountain,—it may be, in time, some sculpture worthy of the site,—no spot in London will show better what may be done in the way of improving the metropolis. The effect produced by this opening out of the space makes it more to be regretted that a fine street has been spoiled in Northumberland-avenue by the erection of buildings so high as to be out of proportion to the width of the street, and actually to darken it.

THE development of that branch of science which deals with explosives is increasing so rapidly that we may shortly expect it to assume distinctive features as a manufacturing trade. The new agent just announced is hellhoffite, a term not derived, as might reasonably be supposed, from any connexion with the infernal regions, but merely from the name of the inventor, Herr Hellhof. Chemically speaking, it is a solution of a combination of naphthaline, phenol, and benzene in fuming nitric acid. Its claims are that, when ignited with fulminate of mercury, it is more powerful than nitro-glycerine, and that it can be stored and transported without the least danger as regards concussion, neither blow, shock, nor open flame having any effect upon it. On the other hand, it has certain disadvantages attending its use,—principally that it is a liquid, and of so volatile a nature, that it can only be stored in perfectly-closed vessels. By mixing it with water, it is rendered completely inexplosive, which, so far, is an additional element of safety; though, *per contra*, this very fact prevents its employment in sub-aqueous works.

FROM a correspondence in the Liverpool *Daily Post* it should seem that two of the Liverpool gentlemen who have been most active in promoting the interests of the annual picture exhibition there, of which we spoke last week, have assumed the position of irresponsible judges and hanging committee, with no professional artistic advice of any kind. That is not the way to increase the confidence of artists in the exhibition, or to promote its continued success in future years. The name of one member of this dual amateur hanging committee is known in artistic circles beyond Liverpool, and it is known that he possesses some knowledge of art, a great deal of zeal, and a considerable leaven of eccentricity; but this combination of qualities is not altogether favourable to commanding the confidence of professional artists, especially of those whose paintings are rejected.

AUTHORS IN LONDON.*

Fuit ætas. It were formerly possible for the wayfarer to picture to himself a celebrated man as deriving some degree of individuality from the street wherein he resided; or to invest any particular thoroughfare with the idiosyncrasies and occupations of its inhabitants. The Grub-street garrets were marked by a borrowed character of their own as distinctive in its kind as that of the coffee-houses in St. James's. But the altered aspect and uses of London streets, the hurry and bustle of daily life, forbid indulgence in these fancies at the actual places which inspire them. We may awhile share that reaction of temperament which provoked Charles Lamb to shed tears of joy amidst the motley tumult of the Strand. To linger in meditation is only to be jostled by the crowd. Passing onwards with the throng, we are fain to reserve our remembrance of things past until the sessions of sweet silent thought can be held in the retirement of home. There we scarcely could desire a better aid to reflection than the volume before us. To our own reproach, it is a kinsman from across the Atlantic who gives us so agreeable a companion. Where much is supplied it were graceless to complain that much is withheld. Mr. Hutton limits his researches to London as a home of men of letters. We cannot demur, then, that men like to St. John and Arbuthnot find no place with their chosen intimates, Swift and Pope; or that the amiable compiler of the "Reliques" appears only in a scrap of his memorable account of a visit, in March, 1759, to Oliver Goldsmith at No. 12, Green Arbour-court. On the other hand, we follow the authors of "The Mill on the Floss" and "Clarissa" from their child-homes to their graves at Highgate and St. Bride's in Fleet-street.

We bear a ready and personal tribute to the extent of the labours that go to the making of so minute a record. That a vast amount has already been written on the subject in no degree removes the obstacles which lie before the conscientious inquirer. As Mr. Hutton remarks in his preface, "The difficulties met with in the preparation of the following pages have been many and great. Old houses have disappeared, streets have been renamed and renumbered, and in many instances entire streets have been swept away in the dreadful march of improvement. It is easier to-day to discover the house of a man who died 200 years ago, before streets were numbered at all, than to identify the houses of men who have died within a few years, and since the mania for changing the names and numbers of streets began . . . . . The confusion caused by this renumbering and renaming can hardly be expressed in words." In apt illustration of this he might have cited the recent interference with St. James's-square, where the original numbers of the houses had become closely connected with their historic associations. In the *Antiquary*, for March last, it was announced that the house, No. 10, Brooke-street, Holborn, where Chatterton died, had just been pulled down. Now, as a matter of fact, No. 10 was then untouched, and was tenanted by a local mission; nor was it the house in which Chatterton closed his life. No. 10 was not dismantled until two or three months ago, together with its neighbours as far northward as Greville-street. Mr. Hutton, quoting both Howitt and Peter Cunningham, cites No. 4 as the house in question. He is correct as to its postal number: Mrs. Angel lived at what was No. 4; but he does wrong to follow them in identifying the house as portion of the furniture shop, latterly Chas. Meeking & Co.'s,* at the street's south-eastern angle with Holborn. The fact is that the street was re-numbered; No. 4 of Chatterton's day became No. 39, being on the *western* side of Brooke-street and a few doors from Holborn. This is evident from an inquiry which was made some years ago. In 1857 one Gifford, a plumber, occupied No. 39; the annoyances he suffered from visitors suggested to Mr. Hollingshead one of Mr. J. L. Toole's most popular farces, "The Birthplace of Podgers." The house remained unchanged, save that its one attic had been converted into two. Thus the view of St. Paul's shown in H. Wallis's painting of the "Death of Chatterton"† was at that time quite possible. No. 39 was demolished in 1881; higher up the street, by Brooke's Market, is the sole memorial to Chatterton in London,—a coffee-house called by his name.

Mr. Hutton refrains from the cheap sentiment that has become but too common of late. He treats us to no silly vapouring about the revered form that may often have been seen on its own doorstep, or regaling in its favourite tavern corner. Going directly to his point he claims completeness and exactitude for his novel results. In equal justice to our author and readers alike, we have been at the care,—with no sinister intent,—to investigate some of those statements which the topographical reader will regard in the light of a revelation. It is no small gain to learn what we read about Walker's Hotel in Soho; or to know that a relic yet remains of Charles Lamb's home in Little Queen-street. But the "tree standing in what had undoubtedly been Lamb's back garden" is one of two fig-trees planted long after Lamb left Little Queen-street, and the garden will soon be absorbed by the new buildings between that thoroughfare and Newton-street. In that house he witnessed the tragedy which, saddening the whole of his after-life, left him with the anxious charge of his sister Mary. Yet Mr. Hutton is not quite correct in what he says about the sign as being still *in situ* of the Feathers Tavern in Hand-court, High Holborn (not Holborn) hard by. That sign,—being the Prince of Wales's crest and motto on a shield,—is not there, and was taken down, we are credibly informed, some three or four years since. There are other slips of a less trivial kind, some of them indeed being repeated in different pages of the book. For instance, under date E. I. H. (East-India House), 21st November, 1823, Charles Lamb writes to Southey: "I am at Colebrook Cottage, Colebrook-row, Islington. A detached whitish house, close to the New River, end of Colebrook-terrace, left hand from Sadler's Wells." Whilst giving this passage, and not without a material error of punctuation, Mr. Hutton deceives his readers. For Charles Lamb never lived in what is, or was, No. 19, Colebrooke-row. Twenty years ago Colebrooke-row (named from the Colebrookes, Lords of Highbury Manor in 1723-91), included twenty-nine houses, in

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* "Literary Landmarks of London." By Laurence Hutton. London: T. Fisher Unwin. 1885.

* Nos. 141-2, Holborn, and Nos. 1-5, Brooke-street, destroyed by fire. A large building on the site of these premises was built, 1878-9, by Mr. Waterhouse, for the Prudential Assurance Company, which Mr. Hutton confuses with the extinct Universal Building Society.

† Lent by the late A. L. Egg to the Manchester Exhibition, 1857. This subject had also been depicted by Singleton in 1794.

one of which, by the way, that adjoining the Castle, Colley Cibber died. But, within eight years afterwards at most, No. 19 was converted into No. 49; and at this day the row (which faces Duncan, Colebrooke, and New-terraces) comprises the seventy-five houses on the eastern side of the covered New River, and on the *right* hand from Sadler's Wells. Lamb's house, then (it is called "Elia," and not "Elia Cottage," and is not "two-storied," but four-storied if the basement be reckoned), is the last on the *western* side, and now semi-detached, being No. 19 (New-terrace), at the remoter end of the so-styled but as yet unnamed Camden-terrace. One may yet see the steps having a return to the right of one descending, from which George Dyer walked into the river,—this was scarcely possible from any other house here,—the very steps which Lamb himself, "o'er all the ills of life victorious," must at times have found to be very awkwardly constructed. And similarly with Lord Macaulay. His boyhood's home in Great Ormond-street is given as No. 50. It has no postal number at all. It forms part of the premises of the London Homœopathic Hospital, whereof the governors, in October, 1857, bought what were then Nos. 50-2, in this street. Nearly all the numbers along the northern side have been lately recast, so that he who, under our author's guidance, goes to No. 50, the Hospital of St. John and St. Elizabeth, as being Macaulay's early home and that of his father, is in effect directed to what in their time was No. 47. Moreover, it is inaccurate to say that Macaulay, when in chambers at No. 8, South-square, Gray's Inn, occupied "a building that has since been torn down to make way for the extension of the library." The new addition to the library (1883-4) was erected over ground on which no chambers had ever previously stood. Nos. 8 and 9, South-square, were pulled down, *circa* 1840, for the then new steward's office and what has since become the old library. Again, the existing parish church of St. Mary-lebone in Marylebone-road, built by Thomas Hardwicke 1813-7, is only in name the successor of the original parish church. This latter, serving by statute as the parish chapel, stands in High-street. At its font were baptised Lord Byron, carried thither from Holles-street; and Lord Nelson's daughter (the late Mrs. Ward) by Lady Hamilton, with the names of Horatia Nelson Thompson.* It was erected in 1741 in place of one dedicated to St. Mary the Virgin, wherein Francis Lord Verulam was christened, and rendered familiar to us as the scene of the marriage in Hogarth's "Rake's Progress" as well as of the churchyard episode in his "Industry and Idleness." That church, to complete the tale, had been established there, and still near to the Aye brook or bourne, in 1400, to succeed the old and decayed Tyburn Church of St. John the Evangelist, which stood close by the first court-house and pound at the southern end of Marylebone-lane. Moreover, Duke-street, Lincoln's Inn-fields, is re-named, albeit absurdly enough, Sardinia-street; and whilst we would gladly credit that Milton-street commemorates Milton's residence and death in the neighbouring Artillery-walk, now absorbed in Bunhill-row, the truth is that Grub-street took its fresh style from one Milton who rebuilt it.

Most people will heartily concur with him who averred that he dreaded to awake each day lest some new discovery should be made about Shakspeare. Mr. Hutton rehearses almost all that may be learned or conjectured about the poet's sojourn in London; though he seems to forget that there was more than one Bull tavern by Bishopsgate. He cites the letter,—the only one extant addressed to him,—which Richard Quyney wrote to his "loveing good ffriend and countryman Mr. William Shackespere," from the Bell Inn, Carter-lane, Blackfriars. The modern public-house of that name and on that site has been marked, by the bye, for destruction for the extension of the Government Savings Bank in Knightrider-street. It should also be observed that on the wall of Nos. 65 and 67, opposite to St. Nicholas Cole Abbey Church, in the latter thoroughfare, is the sign of a bell, with initials and date,— $\frac{M}{T}\frac{}{A}$ 1668. The notices of De Foe, Sir Isaac Newton, Fanny Burney, Leigh Hunt, and Keats are highly interesting and valuable. Mr. Hutton describes as being still there the wooden bench at the lower end of Well-walk, Hampstead, whereon Keats was wont to rest. There he was last seen by Howitt "sobbing his dying breath into a handkerchief, glancing parting looks towards the quiet landscape he had delighted in so much, and musing, as in his 'Ode to the Nightingale.'" The landscape and the Walk itself, with their memories of Constable, Turner, and Clarkson Stanfield, are sadly changed. One can just trace through the brickfields the path along which Coleridge came from Highgate to meet Keats, and, parting from whom at this very seat, Coleridge whispered to Hunt that there was death in that hand. But the seat itself, and we can recollect many like to it about Hampstead and the Heath, is represented by one of the iron benches so dear to the Wells Charity trustees. At No. 76, Cheapside, over Bird-in-Hand-court, leading to the Queen's Arms tavern (locally known as Simpson's), Keats wrote his sonnet upon reading Chapman's translation of Homer, together with nearly all his first volume of poems published in 1817. No. 76 was rebuilt eighteen years ago. We may direct Mr. Hutton's further attention to an announcement of death in the supplement to the *Gentleman's Magazine* for June, 1812. "June 25: In Burrow's-buildings the wife of Mr. Keats, of Cheapside." Keats lost his mother in 1810, when at John Clarke's school, Enfield. His father, according to W. M. Rossetti's memoir, died in 1804. The obituary advertisement is worthy of notice, nevertheless. Mr. Hutton cites, with Rossetti and others, the 29th of October, 1795, as the date of Keats's birth. He was born,—a seven months' child,—on the 31st of that month. This mistake arises from the circumstance that he mentions his birthday in a letter which he heads the 29th of October, but which he did not finish, though with no indication of a pause, until two days afterwards. Amongst those whom, either by their unsettled mode of life or other causes, it is unusually difficult to trace, Mr. Hutton includes Sheridan, who, of course, falls within the former category. We can supplement his list of Sheridan's addresses by reference to a plan of 1794, in the British Museum. R. B. Sheridan is named thereon as occupant of a large house just north of the Opera House (Her Majesty's), Haymarket. The entrance appears as between Nos. 75 and 76, Haymarket, western side, where is now Charles-street. The Royal Comedy Theatre in Panton-street should, we believe, be instanced as marking the situation of Addison's Haymarket lodging, which Pope showed to Harte as being the garret wherein Addison wrote "The Campaign." Theodore Hook is here stated to have gone to a school in Soho-square; he was also at Harrow. To the probably unauthentic description, quoted for what it may be worth, of Dryden's funeral in Westminster, it may be added that the charges amounted to 45*l.* 17*s.*, and that one Russell was undertaker.

A set of block plans done to a large scale (the Ordnance 25 in., say) would materially enhance the value of this compilation as an authority in the future. Failing these, Mr. Hutton is solicitous to indicate by its present postal number or otherwise the position of each existing house he names. It were greatly to be desired that the Society of Arts could complete their inchoate enterprise for the setting up of memorial tablets in well-ascertained positions; for we despair of the London Topographical Society, which in nearly five years has given us but two old maps. The apathy of those who succeed to the heritage whereof Mr. Hutton proves so sedulous an expositor has its worse counterpart in Paris. There the once-honoured titles of many a thoroughfare are exchanged day after day for names which only serve to remind us of those who filled its streets with riot and bloodshed. Here, we retain very little of that spirit which prompted the inscription to Dryden on the curious little house over Fleur-de-Lys-court, Fetter-lane, or the invocation to him who passes by Dante's home in Florence.

* This lady married the Rev. Philip Ward, vicar of Tenterden. She died at Pinner, 1881.

Birmingham.—St. George's Church, Edgbaston, was re-opened on Saturday last, after extensive alterations and additions under the superintendence of Mr. J. A. Chatwin, architect. The greater part of the interior fittings, including a brass eagle lectern, was supplied by Messrs. Jones & Willis, of Birmingham and London.

THE VENTILATION OF THE NEW MUNICIPAL THEATRE AT NICE.

NEARLY two years ago* we published illustrations of the new theatre built by the Municipality of Nice. It will be remembered that a terrible fire destroyed the old structure, and many lives were lost on that occasion. In the article accompanying this illustration we had the pleasure of congratulating the architect, M. Aune, for the taste, skill, and promptitude with which he had raised a magnificent new theatre almost as rapidly as the ashes of the old ones were cleared away. But at the same time we lamented the absence of any scheme of ventilation. This was left to the accident of doors and windows, and we further pointed out that in a town like Nice, where so large a proportion of the visitors are invalids, good ventilation in places of public resort was of more than usual importance. Finally, we suggested that Nice might follow the example set by Geneva, where the Grand Theatre is a model of efficient ventilation.

All these remarks, we have been informed, were faithfully translated into French, and brought to the knowledge of the Mayor and Municipality. With commendable energy letters were at once written to the firm who had so successfully ventilated the theatre of Geneva, and whose work met with the approval of the Fourth International Congress of Hygiene, held at Geneva in September, 1884. Messrs. Geneste & Herscher were forthwith invited to Nice, and entrusted with the ventilation of the new theatre. The building was opened for the first time last season, and the result proved most satisfactory.

A few years ago the grand theatre of Vienna was the only establishment of the sort on the Continent which could be described as scientifically and successfully ventilated by the aid of a motive power yielding exactly the volume of air required. The comfort attained by such a method was so great that, at Frankfort, Brussels, Geneva, and finally Nice, the example has been followed, and in some respects improved upon. Remembering the suffocation endured in the old theatre of Nice, nothing could have been a greater and more agreeable surprise than the ease and fresh air enjoyed in the new structure. The ventilation is based on the principle that the air must not be supplied irregularly and from particular points; but should be admitted in horizontal layers, which, rising gradually from the entire surface of the floor, travel slowly up to the roof without occasioning any currents likely to disturb the spectators. But, further, the air must be so prepared as to be in a proper condition for breathing before it is admitted into the theatre. In other words, it must be warmed in winter and cooled in summer.

On visiting the theatre of Nice we found that these conditions had been realised in the following manner. Over the entire surface, occupied by the stalls and the pit, the air is admitted by means of four hundred apertures. These are made under each chair and protected by iron gratings. They measure about 6 in. by 10 in. The openings therefore present a large surface evenly distributed; the air consequently travels slowly, in spite of its abundance. All these openings are fed by means of shafts into which the air is pumped by a mechanical ventilator. A small gas-engine suffices to put the fan or wheel into motion. In winter the air is previously warmed by a number of hot-water coils. Care is taken, however, not to allow any portion of this air to attain a temperature exceeding 62° to 65° Fahr., and thus it does not lose any of the qualities of fresh air. There is in fact a mixing-room where the warmed air is diluted with cold air that has not passed over the hot-water coils; and with a little personal superintendence it is easy to obtain precisely the required temperature. During the summer, the air is cooled by means of a water pulveriser, which also adds a pleasant moisture to the atmosphere.

The theatre, it is important to note, is not warmed by the air pumped in for breathing purposes. If this were done, the air to combat the refrigerating effects of the windows, walls, and other cold surfaces would have to be heated to a higher degree than pleasant or wholesome for breathing purposes. All the parts surrounding the auditorium, the passages behind the boxes, vestibules, &c., are carefully warmed by hot-air flues.

* See *Builder*, Jan. 5, 1884.

The surrounding temperature is thus maintained at about 65° Fahr. No system of ventilation is provided for this part of the house, nor, indeed, are there any special air-shafts to supply the boxes.

The ventilation is not so elaborate as at Vienna or Geneva; but, on the other hand, it is less complicated and not so expensive. For a theatre of moderate size the success achieved at Nice shows that it suffices if the entire floor of the house admits an up-current of air. This will ventilate sufficiently the front portion of the boxes, the part precisely where the spectators are sitting during the performance. By carefully separating the warming and the ventilating the attendants remain master of the one and the other. More air or more heat can be supplied according to the necessities of the moment; but if the one could not be given without the other, very awkward difficulties might occasionally arise.

The theatre itself is illuminated by 727 gas-jets; but with the passages, crush-room, &c., we have a total of 1,700 gas-burners. During the representation, for instance, of "Faust," 78½ cubic mètres of gas were burned per hour; and, as the entertainment lasted from 7.30 to 12.30 in the night, 393 cubic mètres of gas were consumed. The gas required for the engine, which is only of six-horse power, amounts to one cubic mètre per horse power per hour. The ventilating-fan generally pumps 14,000 cubic mètres of air into the theatre per hour during the winter, and 18,000 cubic mètres in the summer. As there are 1,500 seats in the theatre, this would amount to nine cubic mètres per head per hour in winter, and 12 cubic mètres in the summer. We must also allow for the fact that every seat is not always occupied, and there is a certain amount of accidental and supplementary ventilation due to the opening of doors, windows, &c. To prevent this accidental ventilation becoming in any way unpleasant, care is taken that the passages and outer rooms should always be two or three degrees warmer than the theatre; thus any current caused by the sudden opening of one or more doors is always a warm, and therefore not an unpleasant, current.

The observations made during various performances show that on an average the temperature of the stalls and pit is equal to 63° or 64° Fahr. during the whole evening. In the gallery the temperature is the same during the first hour, but during the second hour it rises to 65° Fahr., and towards the end of the performance it may go as high as 67° or 69° Fahr. At the same time the passages, vestibule, and various annexes had a temperature varying from 65° to 67° Fahr. The fresh air coming into the theatre underneath the chairs in the floor of the house travels at the rate of 15 to 18 centimètres per second, according to the atmospheric pressure and the amount of gas burning at the time. In summer the speed increased to 20, or even 25, centimètres per second, but the current is so evenly diffused that it is not felt by the spectators.

Under these circumstances, the beauties of the new theatre can be enjoyed without any inconvenience. There need be no fear of taking cold, or of enduring the pain of a "theatre headache." For a health resort like Nice such advantages, we repeat, are of the greatest importance, and will not fail to attract people to the town and augment the receipts of the theatre.

In the decoration and ornamentation of the theatre, which were not complete when we described its main architectural features, a great deal has also been done to attract the admiration of visitors. The staircases and vestibules are most capacious and highly ornamented. Two handsome statues representing female forms holding up lamps at the foot of the principal flight of stairs are due to J. Coutant, who won the competition for the Jeu de Paume de Versailles, and the Gambetta statues. In the crush-room there are some fine paintings representing views of Nice and the Bay des Anges, with angelic nudes bathing and rising from the foam of the blue waves. These paintings are by M. Costa, a native artist; but for the scenery and stage machinery it was necessary to employ Messrs. Diosse, of Lyons and Geneva. Altogether, what with the painting, the sculpture, the decorations, the white stone and the red columns of Verona marble, the ample space, the broad passages, majestic staircases, and, above all, the fresh, pure air supplied in such abundance, even in the hottest weather, the theatre of Nice may be considered one of the most attractive places of entertainment of Europe. It remains to be seen whether in the selection of his performers and performances the *impressario* will prove himself equal to the exceptional advantages afforded in this model theatre. In all cases, the architect, M. Aune, and the ventilating engineers, Messrs. Genest & Herscher, have most fully and satisfactorily fulfilled the difficult and important task with which they were entrusted.

THE ANTIQUITIES OF TONG, SHROPSHIRE.

THE interesting Guide,* which Mr. G. Griffiths has just completed, will be read by a large number of English antiquaries, who are probably at present unaware of the many points of history which are enshrined within the walls of Tong Church. Eyton has written eloquently in his "Antiquities of Shropshire" upon the parish, but Mr. Griffith has made more extensive researches, and been thereby enabled to add a considerable amount of new facts to the hitherto published notices of this ancient place. The name itself, at the outset, requires a little elucidation; by some attributed to the sound of a large bell, by others to the grant to Hengist, the Saxon warrior, by a grateful king, of as much land as an oxhide cut into thongs would encompass. A much more likely derivation of the name is suggested by its situation, which is upon a triangular *tongue* of land, formed by two streams, which unite immediately below the western tower of the castle. The descent of the manor has been traced consecutively from Earl Morcar, who forfeited it to William I., who conferred it on his kinsman, Earl Roger de Montgomery. The possession afterwards devolved on the family of Belmeis, then on that of Zouche, and eventually it formed part of the property of the Pembruges, Vernons, Stanleys, Pierpoints, and Durants. From the latter, the father of the present possessor, the Earl of Bradford derived it.

Tong Church fortunately has escaped restoration; hence its value to the archæologist, who may study with advantage the alterations and additions which have been constantly made to the fabric. Earl Roger, described by the chroniclers as a very prudent and moderate man, founded a church here within eight years of the Domesday, and it is believed that a few traces of this original church may yet be observed in the appearance of some of the walls and pillars; but there are no records extant to show when this early church was taken down to give way to the present edifice, which, however, tells its own tale to those who can read stones. Several curious discrepancies of design have been noticed; among them, the not unusual difference in the north and south ranges of arches in the nave; the varied mouldings at the bases of piers, although the capitals resemble one another; the unequal width of the aisles; and the east window not placed in the true centre of the front. The base of the tower is not quite square, nor the octagon equilateral. The spire, however, is very nearly correct in its measurement, and this has rendered necessary a peculiar construction at the junction, which has been illustrated in the *Archæological Journal*. The south porch is furnished with ancient stone seats on either side, and has a fine old carved ceiling of oak-wood. In the south aisle the pillars, carrying the arches forming the arcade between the aisle and nave, are probably older than any other part of the church. The cap of the westernmost pillar is ornamented with the dog-tooth; and the labels of two other arches have the same design. These features have been justly referred to the thirteenth century by Petit, who conjectures that the present south aisle originally formed the nave of the earlier church founded by Earl Roger de Montgomery, as the south side of the pillars is more ornamental than the north, which, perhaps, faced the north aisle of the older edifice. The present floor, on which several of the old oaken benches still remain, probably covers a tiled floor of much older date, portions of which have been discovered in the north aisle, when the new organ was erected some years ago. The old oak roof of the nave, with carved bosses at the intersections, is worthy of notice. The font at the north-east corner of the church is octagonal and of simple design. The west doorway and the north doorway are closed, but should, for obvious reasons, be opened again. In the latter stands the fragment of an old tomb not identified. The wooden screens in the north and south aisles, forming chapels, are of rich workmanship, with the colours well preserved, mellowed and toned down by time.

The tombs form a striking feature of Tong Church. The oldest, that of Sir Fulke de Pembruge, of Tong, and Dame Elizabeth, his wife, daughter and heir of Sir Ralph Lingen, of Wigmore, is chiefly of alabaster. It was originally under the rood-loft,—or "rode-beem," as Chaucer terms this honourable place of sepulture,—but is now placed under the north arch of the tower. Sir Fulke was Lord of Tong in 1371, and died in 1408 or 1409. The armour in which he is represented is partly mail and partly plate. Dame Elizabeth died 1447, and is represented in widow's attire, with wimple on her chin; at her feet a deer or hind, collared and chained. Her head rests on a double pillow, supported on each side by a headless angel. On this tomb was placed on Midsummer-day a chaplet of roses as an annual rent for large privileges in Tong granted to the family of De Hugefort. Dugdale and Eyton appear to be in conflict as to the personages represented on the tomb, but Mr. Griffith considers that the remains of the crest,—a Turkish woman's head with long hair,—determine the effigy. Other tombs worthy of the notice of the antiquary are those of Sir Richard Vernon and his wife Benedicta, 1452; of Sir William Vernon and Margaret his wife, 1467; and of Sir Henry Vernon and his wife Anne Talbot, 1515. Among later monuments, that of Thomas Stanley, second son of Edward, Earl of Derby, deserves mention. We must not conclude this brief notice without a few words on the *ciborium*, here preserved,—a sacramental vessel of the time of Henry VIII., believed to be the work of the celebrated Holbein, and regarded as unique of its kind. This stands 11 in. high, and is of silver gilt and richly chased. It is furnished with a crystal barrel 2 in. deep and 2⅝ in. outside diameter, and 2½ in. inside diameter. This part was fractured in 1875, but has been carefully repaired. It probably belonged to the ancient college of Tong, and then was used to contain the consecrated wafer. It does duty now as a communion cup. The vestry, a detached building with carved doorway of the fifteenth century; the library, tower, and belfry, with eight bells, are carefully described by the author, who has evidently spared no pains in collecting every record of interest relating to the church. For this reason the "Guide to Tong Church" will be read with attention, notwithstanding its modest dimensions, by all lovers of British archæology.

* A Guide to Tong Church, Shropshire. By George Griffiths. Oswestry: Woodall & Co. 1885.

ENGINEERING TOPICS AT THE BRITISH ASSOCIATION MEETING.

MR. B. BAKER, in his address as President of the Mechanical Science Section of the British Association meeting at Aberdeen, said he should ask his hearers to consider how far the existing practical rules respecting the strength of metallic bridges are "founded on reason, how far on custom, and how far on error?" He proceeded:—The first question obviously is, What are the rules adopted by engineers and Government departments at the present time?—and it is one not easily answered. I have for some time past been receiving communications from leading Continental and American engineers, asking me what is my practice as regards the admissible intensity of stress on iron and steel bridges, and in replying I have invited similar communications from themselves. As a result, I am able to say that at the present time absolute chaos prevails. The old foundations are shaken, and engineers have not come to any agreement respecting the rebuilding of the structure. The variance in the strength of existing bridges is such as to be apparent to the educated eye without any calculation. If the wheels of a miniature brougham were fitted to a heavy cart, the incident would excite the derision even of our street boys, and yet equal want of reason and method is to be found in hundreds of bridges in all countries. It is an open secret that nearly all the large railway companies are strengthening their bridges, and necessarily so, for I could cite cases where the working stress on the iron has exceeded by 250 per cent. that

considered admissible by leading American and German bridge-builders in similar structures. In the case of old bridges, the variance in strength is often partly due to errors in hypothesis and miscalculation of stresses. In the present day engineers of all countries are in accord as to the principles of estimating the magnitude of the stresses on the different members of a structure, but not so in proportioning the members to resist those stresses. The practical result is that a bridge which would be passed by the English Board of Trade would require to be strengthened 5 per cent. in some parts, and 60 per cent. in others, before it would be accepted by the German Government or by any of the leading railway companies in America. This undesirable state of affairs arises from the fact that in our own and some other countries many engineers still persistently ignore the fact that a bar of iron may be broken in two ways, namely, by the single application of a heavy stress, or by the repeated application of a comparatively light stress. An athlete's muscles have often been likened to a bar of iron, but, if "fatigue" be in question, the simile is very wide of the truth. Intermittent action,—the alternative pull and thrust of the rower, or of the labourer turning a winch,—is what the muscle likes, and the bar of iron abhors. Troopers dismount to rest their horses, but to relieve a bar of iron temporarily of load only serves to fatigue it. Half a century ago Braithwaite correctly attributed the failure of some girders, carrying a large brewery vat, to the vessel being sometimes full and sometimes empty; the repeated deflection, although imperceptibly slow and wholly free from vibration, deteriorating the metal, until, in the course of years, the girders broke. These girders were of cast iron; but it was equally well known that wrought iron was similarly affected, for in 1842 Nasmyth called the attention of this section to the fact that the "alternate strain" in axles rendered them weak and brittle, and suggested annealing as a remedy, he having found that an axle which would snap with one blow when worn, would bear eighteen blows when new, or after being annealed. So important a matter as the action of intermittent stresses could not escape the attention of the Royal Commissioners appointed in 1849 to consider the application of iron to railway structures, and some significant and sufficiently conclusive experiments were made by Captain Douglas Galton and others. Cast-iron bars, 3 in. square and 13 ft. 6 in. span between the supports, were deflected, both by the slow action of a cam, and the percussive action of a swinging pendulum weight. When the deflection was that due to one-third of the breaking-weight, about 50,000 successive bendings by the cam broke one of the bars, and about 1,000 blows from the pendulum another. When the deflection was increased from one-third to one-half, about 500 applications of the cam, and 100 blows, sufficed to rupture two of the specimens. Slow-moving weights on bars and on a small wrought-iron box girder gave analogous results; and the deduction drawn by the experimenters at the time was that "iron bars scarcely bear the reiterated application of one-third the breaking-weight without injury, hence the prudence of always making beams capable of bearing six times the greatest weight that could be laid upon them." Although these experiments were entirely confirmatory of all previous experience, they would appear to have little influenced the practice of engineers, since Fairbairn, more than ten years later, in a communication to this section, said that opinions were still much divided upon the question whether the continuous change of load which many wrought-iron structures undergo has any permanent effect upon their ultimate powers of resistance. To assist in settling the question he communicated to the Association the results of some experiments carried out by himself and Professor Unwin on a little riveted girder, 20 ft. span, and 16 in. deep. Once more the same important but disregarded facts were enforced on the attention of the engineers. About 5,000 applications of a load equal to four-tenths of the calculated breaking load fractured the beam with the small ultimate defection of three-eighths of an inch, and subsequently, when repaired, the beam broke with one-third of the load, and a deflection of but a quarter of an inch, which sufficiently indicated how small a margin the factor of safety of four, then currently adopted, allowed for defective manufacture, inferior material, and errors in calculation. Still nothing was done, and the general practice of engineers and the Board of Trade regulations continued unaltered. Hundreds of existing railway bridges, which carry twenty trains a day with perfect safety, would break down quickly under twenty trains per hour. This fact was forced on my attention nearly twenty years ago by the fracture of a number of iron girders of ordinary strength under a five-minute train service. Similarly, when in New York last year, I noticed, in the case of some hundreds of girders on the "Elevated Railway," that the alternate thrust and pull on the central diagonals from trains passing every two or three minutes had developed weaknesses which necessitated the bars being replaced by stronger ones after a very short service. Somewhat the same thing had to be done recently in this country with a bridge over the Trent, but, the train service being small, the life of the bars was measured by years instead of months. Although, as already stated, many more experiments are required before universally acceptable rules can be laid down, I have thoroughly convinced myself that, where stresses of varying intensity occur, tension and compression members should be treated on an entirely different basis. If, in the case of a tension member, the sectional area be increased 50 per cent. because the stress, instead of being constant, ranges from *nil* to the *maximum*, then I think 20 per cent. increase would be a liberal allowance in the case of a compression member. I have also satisfied myself that if a metallic railway bridge is to be built at a *minimum* first cost, and be free from all future charges for structural maintenance, it is essential to vary the working stress upon the metal within very wide limits, regard being had not merely to the effect of intermittent stresses, but also to the relative limits of elasticity in tension and compression members even under a steady load. Engineers must remember that if satisfactory rules are to be framed they, and not Governmental departments, must take the initiative. In former days the British Association did much to direct the attention of engineers to this important matter, but, so far as I know, the subject has been dropped for the past twenty years, and I have ventured, therefore, to bring it before you again in some detail. Mr. Baker then referred to the fact that the labours of the present generation of engineers are lightened beyond all estimate by labour-saving appliances. To prove how much the world is indebted to students of this branch of mechanical science and how rapid is the development of a really good mechanical notion, it is not necessary to refer to the numerous hydraulic appliances of the kind first introduced forty years ago by a distinguished past President, Sir W. G. Armstrong. It would not only be impossible to build a Forth Bridge, but it would be equally impossible to fight a modern ironclad without the aid of hydraulic appliances. In conclusion, he said:—Members of this section who visited the United States last year not for the first time could hardly have failed to notice that American and European engineering practice is gradually presenting fewer points of difference. Early American iron railway bridges were little more than the ordinary type of timber bridge done into iron, and the characteristic features, therefore, were great depth of truss, forged links, pins, screw bolts, round or rectangular struts, cast-iron junction pieces, and, in brief, an assemblage of a number of independent members more or less securely bolted together, and not, as in European bridges, a solidly-riveted mass of plates and angle-bars. At the present moment the typical American bridge is distinctly derived from the grafting of German practice on the original parent stock. Pin connexions are still generally used in bridges of any size, but the top members and connexions are more European than American in construction, while for girders of moderate span, such as those on the many miles of elevated railway in New York, riveted girders of purely European type are admittedly the cheapest and most durable. From my conversations with leading American bridge-builders I am satisfied that their future practice and our own will approach still more nearly. We should never think of building another Victoria tubular bridge across the St. Lawrence, or repeat the design of the fallen Tay bridge, nor would they again imitate in iron an old timber bridge, or repeat the design of the fallen Ashtabula bridge. In one respect the practice in America tends to the production of better and cheaper bridges than does our own practice, and it is this: each of the great bridge-building firms adopts by preference a particular type design, and the works are laid out to produce bridges of this kind. It is an old adage that practice makes perfect, and by adhering to one type, and not vaguely wandering over the whole field of design, details are perfected and a really good bridge is the result. Engineers in America, therefore, need only specify the span of their bridge, and the rolling load to be provided for, with certain limiting stresses, and they can make sure to obtain a number of tenders from different makers of bridges varying somewhat in design, but complying with all the requirements. With us, on the other hand, it is too often the privilege of a pupil to try his 'prentice hand on the design for a bridge, and it is no wonder, therefore, that many curious bits of detail meet the eye of an observant foreigner inspecting our railways. The magnificent steel wire rope suspension bridge of 1,600 ft. span, built by Roebling, across the East River at New York, well marks the advanced state of mechanical science in America as regards bridge-building. It is worthy of note that at the second meeting of the British Association, held so long back as 1832, there was a paper on suspension bridges, and the author entreated the attention of the scientific world, and particularly of civil engineers, to the serious consideration of the question, How far ought iron to be hereafter used for suspension bridges, since a steel bridge of equal strength and superior durability could be built at much less cost? "I earnestly call upon the ironmasters of the United Kingdom," said he, "to lose no time in endeavouring to solve this question." In this, as in many other engineering matters, Americans have given us a lead. America is, indeed, the paradise of mechanics. When the British Association was inaugurated, years ago, there was, I believe, no intention to have a section for the discussion of mechanical science. Possibly it may have been considered too mean a branch. Even the usually generous Shakspeare speaks contemptuously of "mechanic slaves, with greasy aprons, rules, and hammers," and our old friend Dr. Johnson's definition of "mechanical" is "mean, servile." We have lived down this feeling of contempt, and the world admits that the "greasy apron" is as honourable a badge as the priest's cassock or the warrior's coat of mail, and has played as important a part in the great work of civilising humanity and turning bloodthirsty savages into law-abiding citizens.

Mr. W. H. Barlow moved and Professor Thomson seconded a vote of thanks to Mr. Baker for his address, and this was cordially passed.

Mr. C. Barlow read a paper on the new Tay Viaduct. Considerable interest was attached to this undertaking, because of the comparatively few viaducts of such a length crossing tidal water in such an exposed position, and also because of the fact that it was to replace the Tay Bridge, which was rendered useless by the memorable disaster of December, 1879. The Tay Viaduct was being constructed at the side of, and 60 ft. distant from, the bridge. Its total length was 3,600 yards; the number of spans 85, varying from 50 ft. to 230 ft. in width; and the greatest height of rails above high-water, 83 ft. At the navigable channel in the middle of the river there was a clear headway of 77 ft. for shipping. The southern end of the viaduct consisted of four arches of 50 ft. span, with their abutment and piers, all built of brick. In plan this arching was wider at the southern than at the northern end, to accommodate a junction of the Newport branch with the main line. The northern or Dundee end consisted of seven spans over the Dundee esplanade and the proposed extension of the same. The two first spans were wrought-iron skew arches, to suit the direction of the intended esplanade, and the remainder were girders on brick piers and cast-iron columns. The centre portion of the viaduct, over the tidal water, had 74 spans, consisting of wrought-iron girders resting on piers. The piers were constructed as follows:—The cylinder foundations (with the exception of a few of cast-iron) were constructed of wrought-iron caissons up to low-water level, lined with brickwork and filled with concrete, above which was a brick shaft filled with concrete; the diameter of their bases varied from 10 ft. to

23 ft., according to the spans. Except in a few cases where rock was met with, the cylinders were sunk to a depth between 20 ft. and 30 ft. below the bed of the river, so as to be out of reach of the scouring action of the tide; and before building the upper part they were tested with a weight of 33 per cent. more than the *maximum* load which could come upon them. At the top of the cylinders and above high water was a strong connecting-piece 8 ft. high, and nearly as wide as the diameter of the cylinders, constructed of cast-iron girders, wrought-iron ties, brickwork, and concrete. Above this was the wrought-iron superstructure or shaft of the piers, consisting of two octagonal shafts rising from each cylinder, and attached to the same by long bolts. These shafts are joined together near the top of the pier by a semicircular arch, forming at the top one structure. The whole is constructed of wrought-iron plates riveted together with channel, tee, and angle irons. The dimensions of the girders were very various. The present state of the works was then described.

Mr. A. S. Biggart read a paper on the proposed method of erecting the main steel piers and approach viaducts of the Forth Bridge. In view, he said, of the near completion of the caisson piers, the difficulties met with in founding them were practically relegated to the past, while those in connexion with the erection of the superstructure now in progress were in the near future. The superstructure immediately over the three groups of four caissons were the first parts to be taken in hand. The portions which were known as the steel piers consisted of four rising columns connected at the top and bottom, thus forming, as it were, two sloping and two vertical planes, in which the various diagonal bracing members lay. The internal viaducts and other lesser parts completed the steel piers. The approach viaducts, with the exception of a few new features to meet the universal requirements demanded of them, were of ordinary design. Coming to the erection of the steel piers, difficulties were at once encountered. A pier to be carried to a height of 360 ft., and requiring during its erection the simultaneous lifting of a platform weighing over 400 tons, demanded that exceptional means should be employed in its construction. Various methods of accomplishing this were proposed. That now fixed upon by Mr. Arrol, with the full approval of Sir John Fowler and Mr. Baker, consisted in carrying from near the base a rectangular platform surrounding the whole pier, supported by and lifted from off four rising columns. From this platform, which was raised from time to time as the work of construction proceeded, there would be carried on the building of the columns, the bracing girders, and other parts. On arrival at the top the connexion member between the columns would then be built and riveted while resting on the platform. The lower and upper bed-plates were riveted inside by a special machine, which consisted of two girders, one placed above and the other below the bed-plate, while on each of the girders a sliding hydraulic cylinder was used for closing up the rivets. While the approach viaduct on the south side was well in hand, that on the north side was still further advanced, being nearly complete. Thus far all had gone well, no difficulty having arisen which could be said to have taxed the ability of either the engineers or contractors, and judging the future from the past he had every reason to conclude that in the near future the successful erection of the Forth Bridge would be a matter of history.

In the discussion which followed, Mr. W. H. Barlow observed that the Forth Bridge, when erected, would be notable as containing the largest span ever erected. It would also be famed for its capability to bear heavy strains, every possible test having been applied to insure its stability.

Professor W. C. Unwin said that in all his experience as an engineer he had never seen anything so extraordinary as the Forth Bridge. Professor Thomson, of Glasgow, and other gentlemen also made a few general remarks concerning the Forth and Tay Bridges.

The Chairman replied to the remarks which had been made, so far as they related to the Forth Bridge. He explained the extraordinary tests which had been applied to determine the question of expansion, and the calculations which had been made. They had assumed the impossible condition of a wind pressure of 56 lb. to the square inch blowing down the Forth on the one side and up it on the other. If such a cyclone as that could be imagined, the whole of the slack they had provided in their bolt-holes would be required, but not otherwise. With regard to the stresses on the bridge, each member had been considered separately and individually in the light of the experiments carried out on the material actually being used. The *maximum* strain was 7½ tons, but there were many instances in which the stresses were not more than 3¾ tons, and even less. He pointed with satisfaction to the fact that bridges on the model of the Forth had been built in America, and that two were about to be erected in India.

The thanks of the meeting were accorded to Mr. Barlow and Mr. Biggart for their papers.

Illustrations.

THE JAMAICA TAVERN.

WE publish this week an illustration of the new Jamaica Coffee-house and Tavern, St. Michael's-alley, Cornhill, now in course of erection from the designs and under the superintendence of the architect, Mr. Banister Fletcher.

The building is a free adaptation of Renaissance, to suit the confined nature of the site. It is being erected in red brick facings with Mansfield stone dressings.

The builder is Mr. Oldrey, the stained-glass is from the studio of Mr. Evans, and the carving is by Mr. McCullock.

The celebrated "coffee-house" which this building replaces was for many years a principal *rendezvous* of the shipowners and merchants of London. Some record of the past will be kept by the painted windows of the buffet, which will represent scenes in the past history of the building.

NAWORTH CASTLE, CUMBERLAND: RESTORED PORTIONS.

The disastrous fire which occurred here in 1844 completely destroyed the interior of this building, except that known as Lord William Howard's tower. The fire necessitated a remodelling, which was carried out by Mr. Salvin, but the exterior still happily preserves its face much as left by Lord William (the "Belted Will" of Sir Walter Scott). Such parts of the fabric as the walls, which were sound, were restored at the time of the fire by the then Earl of Carlisle, under the direction of Mr. Salvin. The rooms which were restored by Mr. Salvin have now been refitted in hard woods, and a small new court has been added in the place of some modern buildings, so as to gain the necessary accommodation for a large family without tampering with the ancient part of the castle.

Our illustrations, which are from drawings which were exhibited at the Royal Academy this year, show these additions, which were described in the *Builder* for March 10, 1883, when we published a two-page view of the Stanley Tower. The whole of these works have been carried out from the designs and under the superintendence of Mr. C. J. Ferguson, F.S.A., architect, Carlisle.

We may add that some historical and architectural particulars of the old buildings were given in the *Builder* on the date previously mentioned, and that fuller details may be found in papers read before the Cumberland and Westmoreland Antiquarian and Archæological Society in 1879 by Messrs. R. S. & C. J. Ferguson.

REMINISCENCES OF THE ARCHITECTURAL ASSOCIATION EXCURSION.

THE REINDEER INN, BANBURY.

THE detailed door and panelling we illustrate this week are from the room referred to in the report of the Architectural Association's excursion, when describing this old inn at Banbury [p. 252, *ante*]. It is a most interesting and complete bit of work, and, considering its present use (a sort of market-room attached to the inn), is in as good a state of preservation as can well be expected. The cornice seems to have suffered most, and some portions of the ornamental detail are missing here and there. The room is not large, but has a fine fireplace at one end, the bay window (a view and measured detail of which were given in the *Builder* for August 15) being on one side, and a long low stone-mullioned window opposite to the bay. The room is entered from the angle doorway shown in the view, and a tiny lobby is formed by the inner doorway being set across the angle of the room, a similar doorway across the angle on the opposite side of the bay forming a cupboard. The detail is very refined and delicate, and beautifully executed. The plaster ceiling of this room is unusually fine, an ornamental band forming geometrical patterns, the spaces within and between being filled with well-designed bits of raised ornament, nearly all of them being different. A ceiling almost the counterpart of this as regards the bandwork is over one of the rooms at Compton Winyates, but the ornamental filling in is quite different.

ADDERBURY CHURCH: ROOF OVER NAVE.

This is a very simple form of roof, but very pleasing and substantial-looking, the shaped principal rafters and struts telling with good effect. The four principals eastwards, having a cusped enrichment to curved portions, add very much to the appearance. There are ten principals altogether, including the two against the east and west walls, the length of the nave being about 71 ft., and the span about 18 ft. 9 in.

SHUTFORD CHANCEL SCREEN.

There were some much more elaborate screens seen on the excursion than the one at Shutford, but it is a good example of a simple treatment which could be well repeated where funds are limited, the general effect being better than is shown by a mere elevation. The lower panels are modern, as is also the capping to cornice.

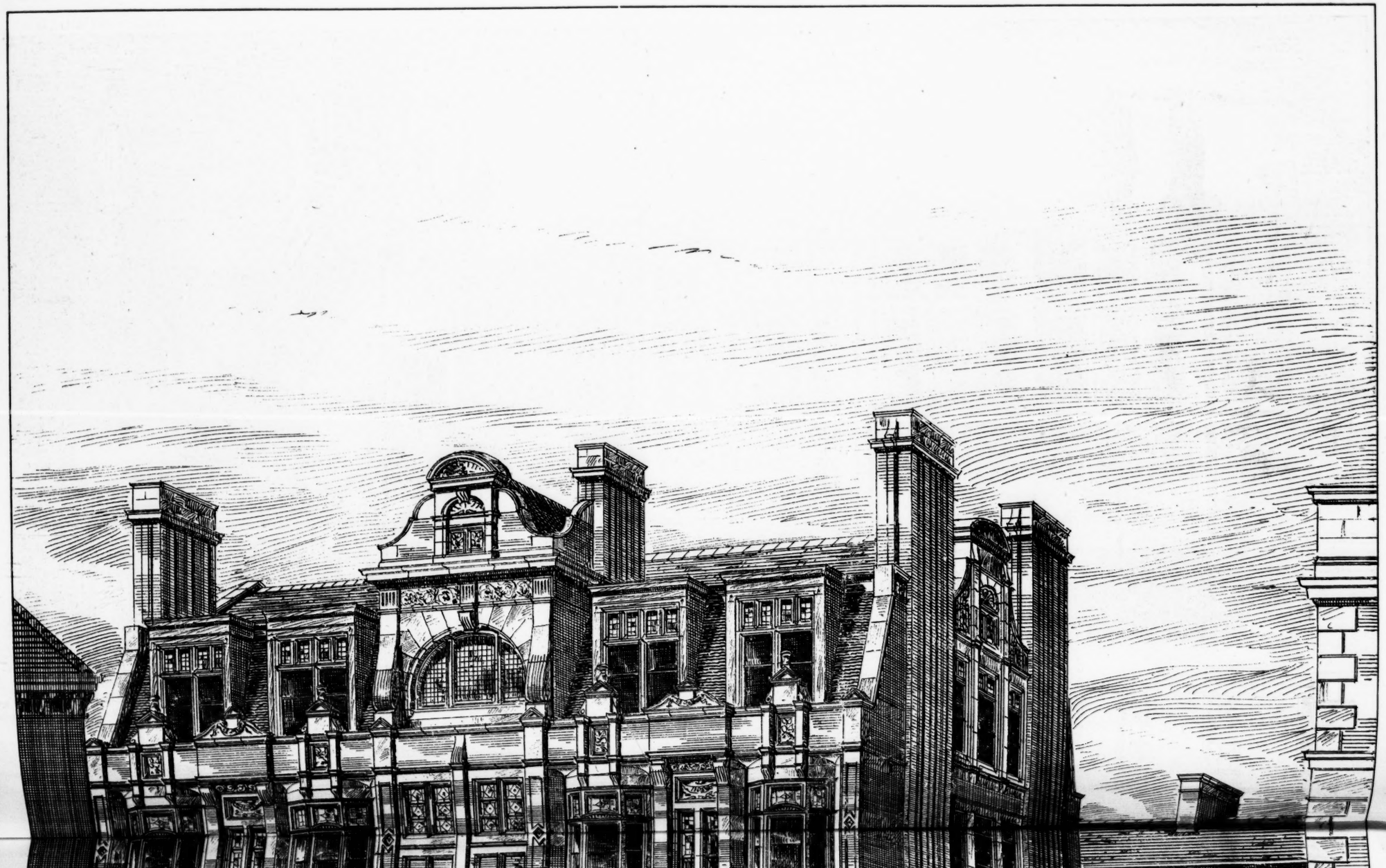
STAIRCASE IN PARSONAGE HOUSE, DEDDINGTON.

The upper portion of the staircase sketched here (which we promised to give in a former number) is very freely treated, and has many unusual points; wherever an opportunity of varying the treatment has occurred it has not been lost. It goes up three floors, and though the general framed portions have a somewhat heavy appearance, much of the detail is refined.

DEDDINGTON CHURCH.

The groining of the north porch to this church is very striking. The porch is square on plan, and the vault has the effect of being an enriched flat dome, the circular rib touching all four sides of the square within which the ribs radiating from a central ring are ornamented with cusped tracery, the spandrels being filled up with a trefoil. The section is four-centred, almost flat at the top, and the section of the rib is the same throughout, excepting to the trefoil in spandrels, which is smaller.

Fatal Accident with a Steam Tramway Engine.—A terrible accident occurred on Saturday last at Bradford. One man and two horses were killed on the spot, and another man died subsequently from injuries received. The fatalities occurred through the engine, from some unexplained cause, starting off out of the shed in which it was standing, and rapidly attaining speed down the incline of Manchester-road, it came into collision with the ordinary traffic, with the results mentioned. At the Board of Trade inquiry, held on Wednesday, it was stated that the brake had been disconnected to allow of repairs. The steam was only at 30 lb. pressure when the engine suddenly started off; 45 lb. of steam were required to start it on a dead level. The foreman of the yard could assign no reason for the engine suddenly starting off. The steam brake would not act, because the steam pressure was too low. The driver seemed to do all in his power to stop the engine, and when it was brought to a standstill the first time he was unconscious. The engine started off the second time because of the straightening of the hook of the coupling by which it had been attached to another engine on the first stoppage. John Umpleby, the engine-driver, at the conclusion of his evidence, was complimented by Major-General Hutchinson, who said it was clear he had done everything he could to stop the engine, even at the risk of his life. The inquiry was adjourned until the 24th inst.



C. F. Kell, Photo-Lith & Printer.

8, Castle St Holborn, London, E.C.

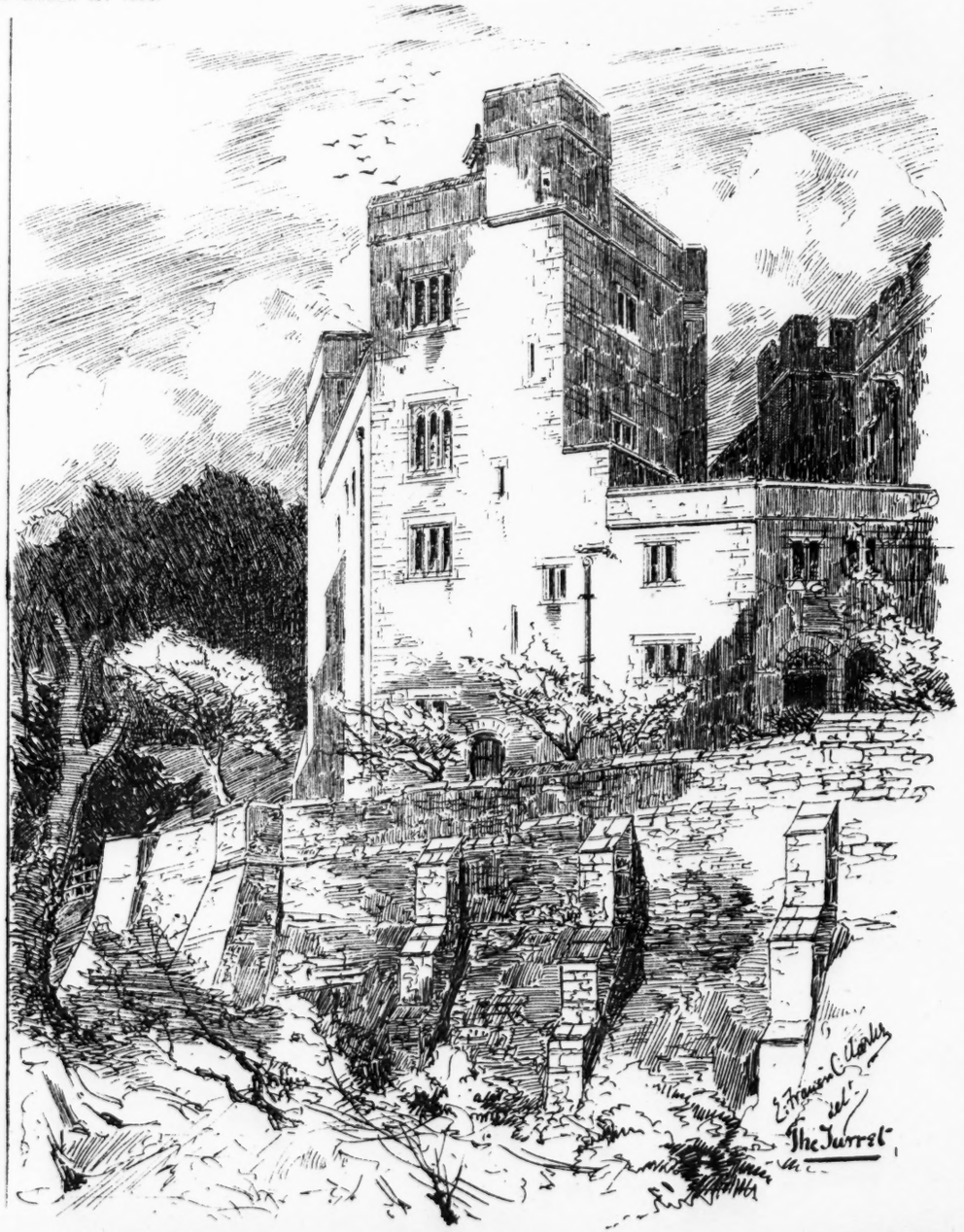
THE "JAMAICA" COFFEE TAVERN. MR. BANISTER FLETCHER, F.R.I.B.A., ARCHITECT.

The Wicket
To the New Court

The New Court
East

SKETCHES OF RESTORED PORTIONS: NAWORTH CASTLE. MR. C. J. FERGUSON, ARCHITECT.

C.F.Kell. Photo-Litho. Castle St Holborn, London, E.C.



SKETCHES OF RESTORED PORTIONS: NAWORTH CASTLE. MR. C. J. FERGUSON, ARCHITECT.

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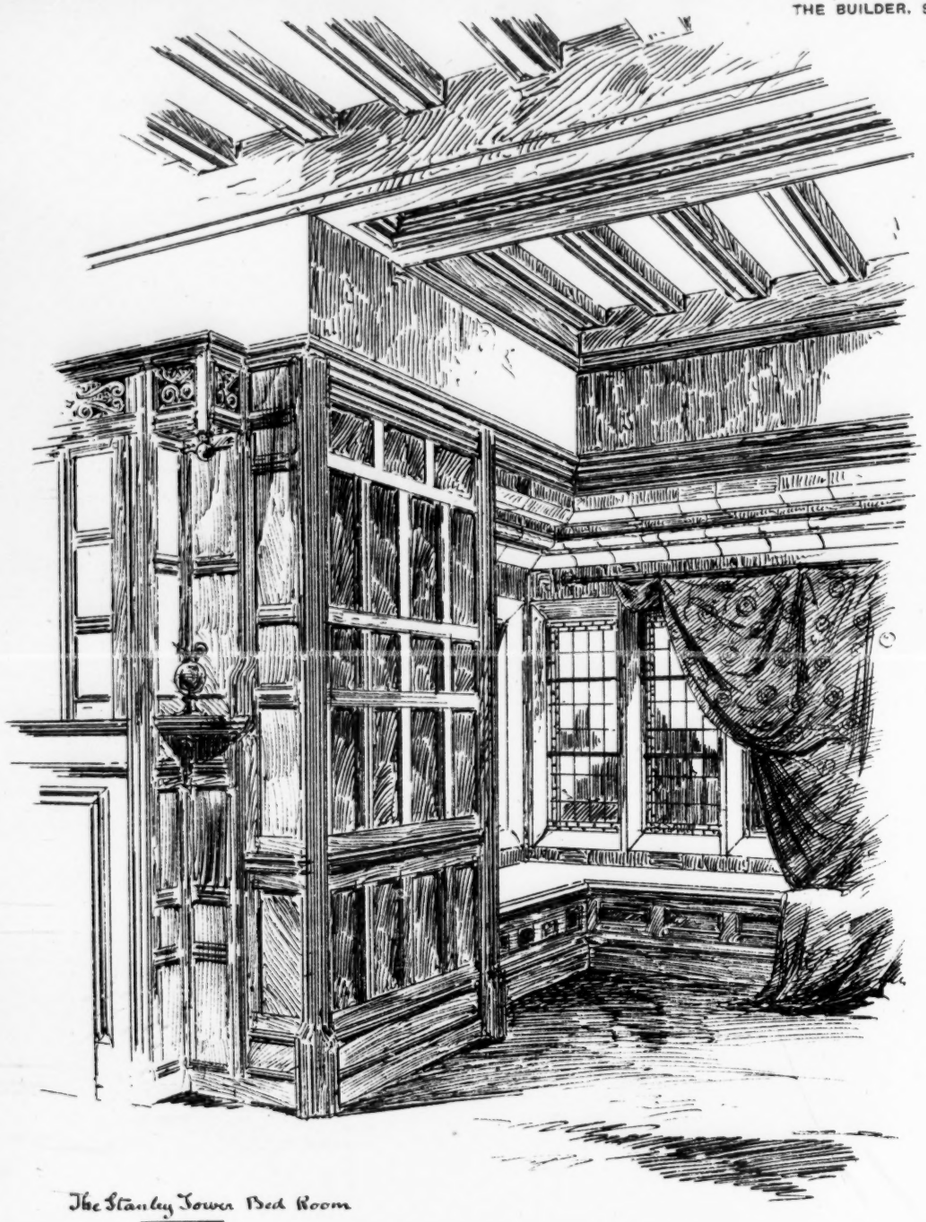


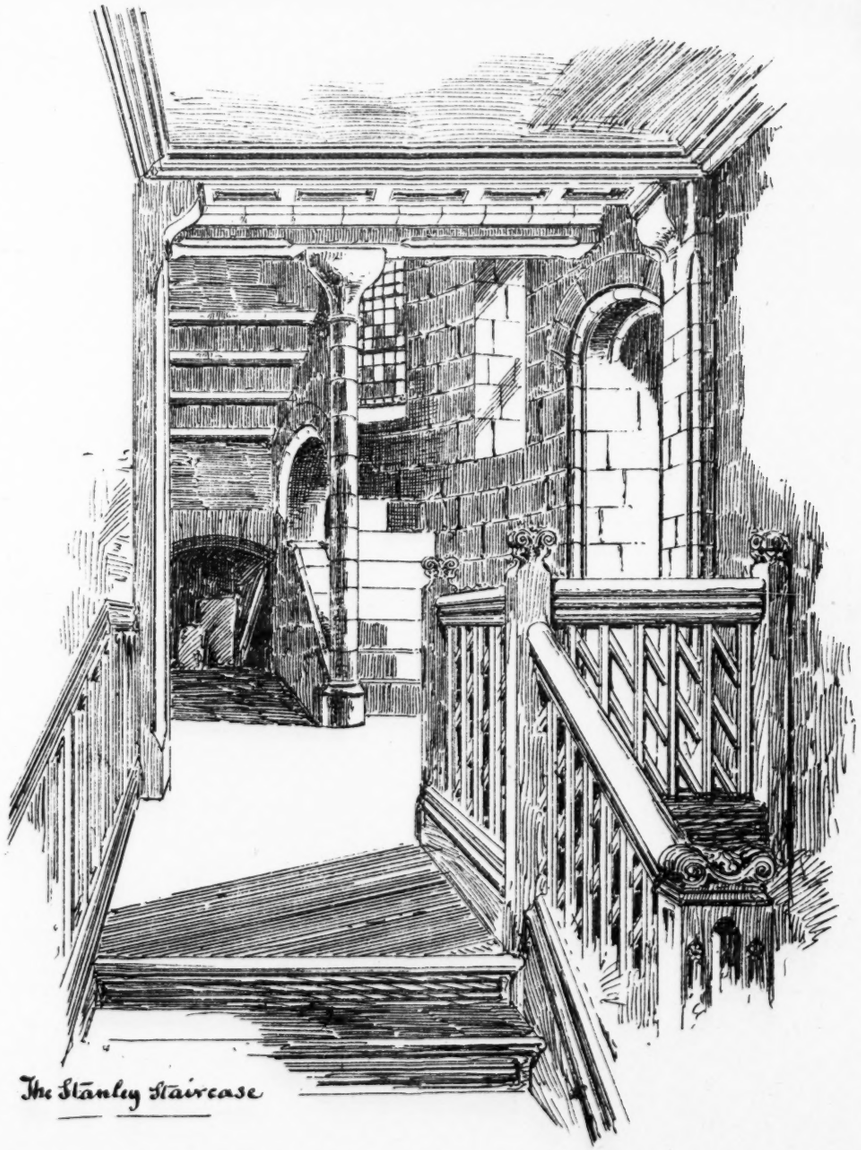
The Stanley Tower Bed Room

The Bridge

C.F.Kell, Photo-Litho. Castle St Holborn, London, E.C.

SKETCHES OF RESTORED PORTIONS: NAWORTH CASTLE. MR. C. J. FERGUSON, ARCHITECT.

The Turret Stair

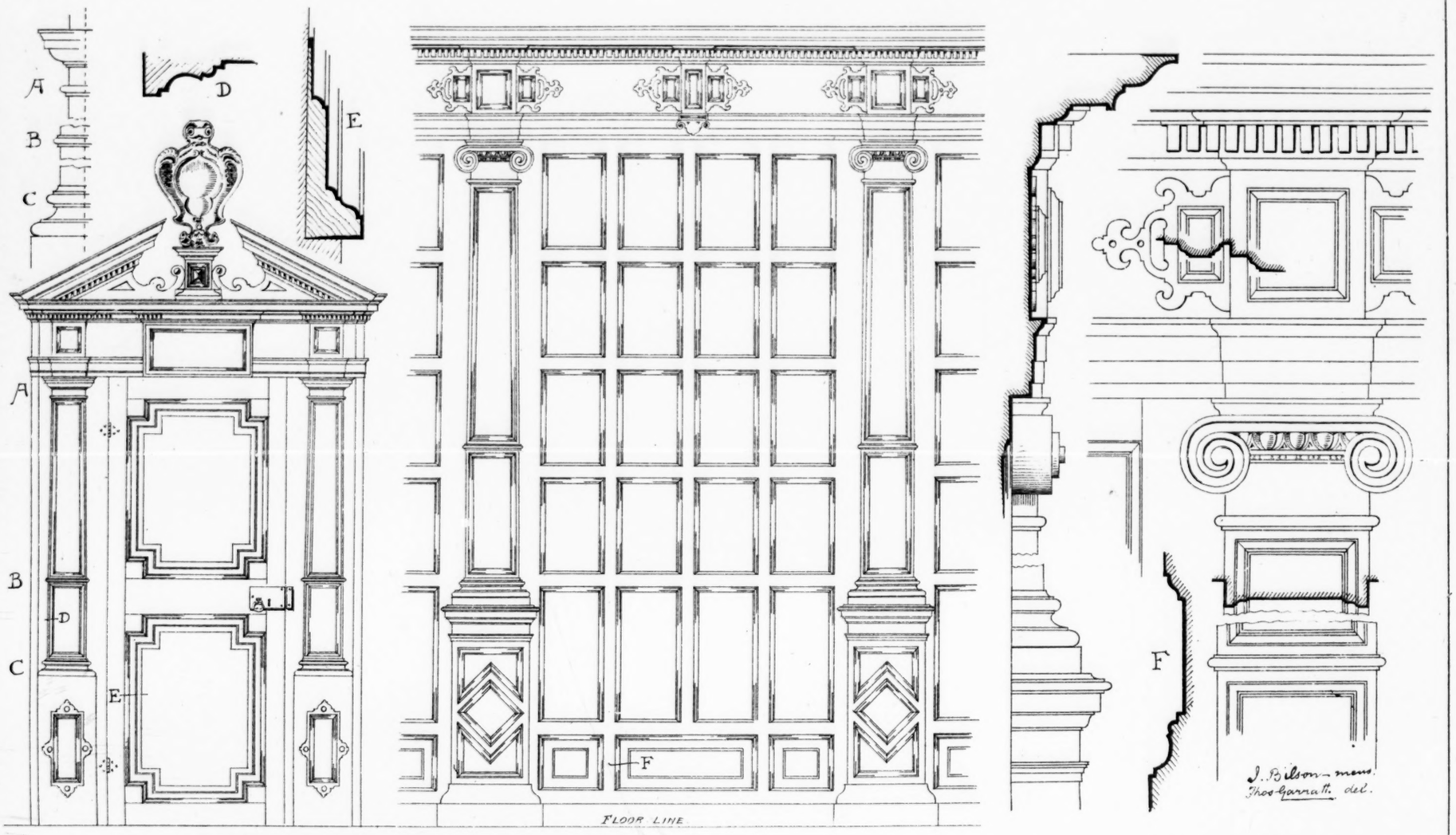


The Stanley Staircase

C F Kell Photo-Lith & Printer 6 Castle St Holborn London E C

SKETCHES OF RESTORED PORTIONS: NAWORTH CASTLE. MR. C. J. FERGUSON, ARCHITECT.

REINDEER : INN : BANBURY



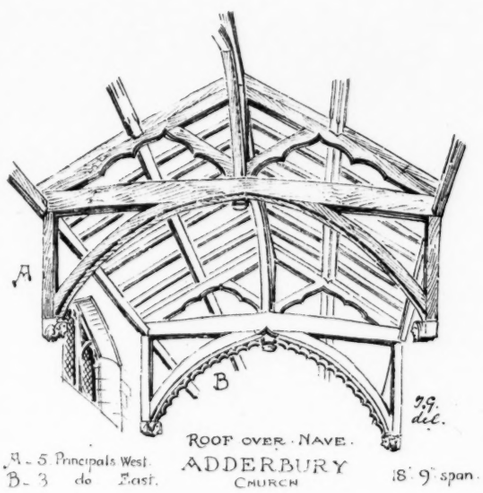
Corner Doorway. Panelled Room. Section Elevation

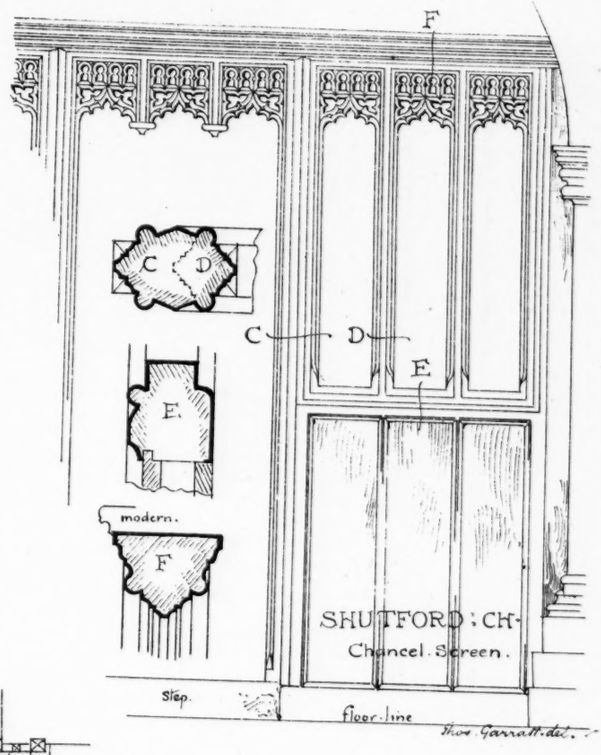
inches 12 9 6 3 0 1 2 3 4 5 6 7 8 9 feet

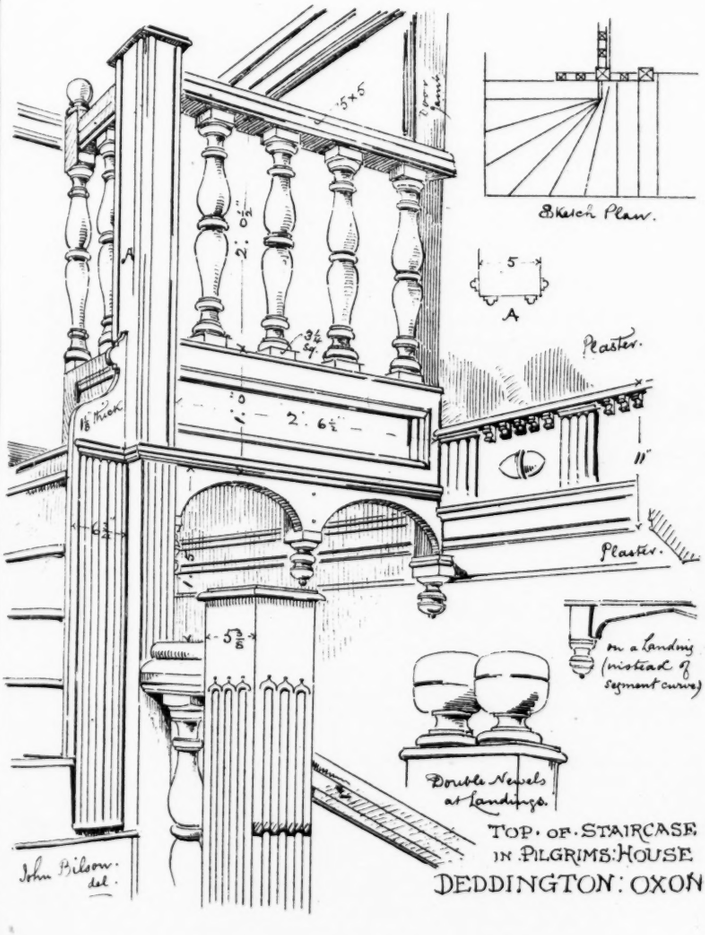
0 5 10 15 20 inches

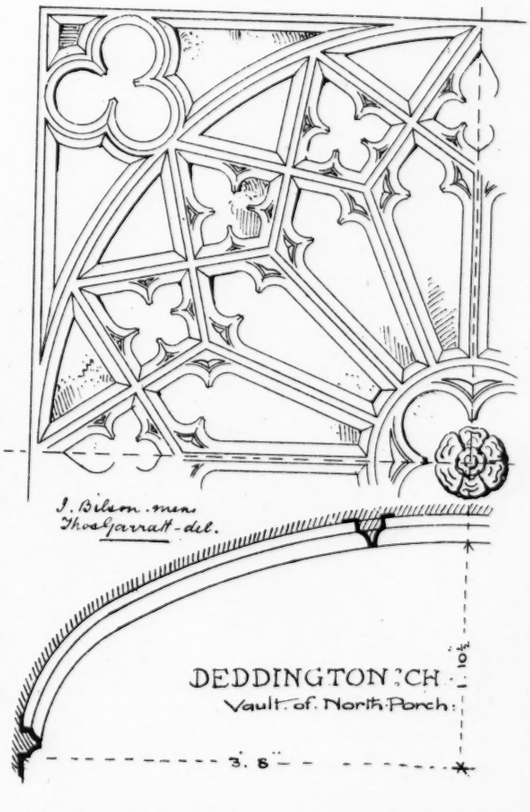
THE BUILDER, SEPTEMBER 19, 1885.

PHOTO-LITHO. SPRAGUE & Co. LONDON









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REMINISCENCES OF THE ARCHITECTURAL ASSOCIATION EXCURSION, 1885.

THE TRADES' UNION CONGRESS.

CONTINUING our notes of the proceedings at this Congress,* we may first of all mention that Thursday, the 10th inst., was mainly occupied with the discussion of political questions.

On the subject of co-operation, Mr. Sedgwick (Leicester) moved,—

"That this Congress views with satisfaction the appointment of a joint committee, consisting of representative trades unionists and co-operators, with power to take such steps as may from time to time be deemed necessary in order to (firstly) promote the extension of the principles of co-operation, and (secondly) maintain intact cordial relations between both bodies on all questions affecting the status of the workpeople employed in co-operative manufactories."

He said they had two systems running on pretty nearly parallel lines, but for some reason or other they had both been pulling against the stream. If only a proper understanding could be arrived at, and a firm basis of agreement established, the members of trades unions and co-operative societies would both be greatly benefited.

Mr. Watters (Manchester) seconded the resolution. He said it had been remarked that co-operation and trades unionism could not work together. He was there to deny that statement. He was employed by a co-operative firm started by trades unionists. To his mind co-operation and trades unionism were the two "masterpieces" for the improvement of the working-classes, and if they could get the two to work together they should accomplish a great deal.

The discussion was continued by Mr. Knight (Newcastle), and Mr. Cameron (London); and Mr. Bland and Mr. Percival, members of a board of directors of a co-operative society, at the invitation of the President, addressed the Congress, urging that co-operation was calculated to confer great benefits on the working-classes.

Mr. Coote (London) gave Mr. Slatter credit for bringing about a better understanding between trades unionists and co-operators, and said he believed that so long as co-operators were content to work on trade union principles every working man would be ready to say "God speed," but when they went outside those principles, as in some cases they were trying to do, many men would protest emphatically against such action.

The resolution was carried unanimously.

On the fifth day of the Congress (Friday, the 11th inst.), the question of the next meeting-place for the Congress next came up for discussion. Three towns were proposed, — Hull, Norwich, and Swansea,—and on a vote being taken, the first-named place was adopted by the Congress.

The following resolution appeared upon the agenda paper, Mr. Smith (Sunderland) proposing, and Mr. Forbes (Glasgow), seconding it:—

"That this Congress recognises the hardships entailed on workmen by the use of the 'character inquiry note,' and expresses its disapproval of the continuance of the same, and further requests the Parliamentary Committee to endeavour to have clause 7 of the Conspiracy and Protection of Property Act, 1875, so amended as to deal with this question."

Mr. Judge (Leeds) opposed the motion, which he regretted to see had been brought before the Congress. If they were to do what was asked them,—to support the resolution,—they would, so far as the union was concerned, put weapons into the hands of their employers, by whom they would be unmercifully attacked. He thought the matter was entirely in their own hands, and they had no need of Parliamentary interference.

On being put to the vote, the resolution was passed by 64 votes to 27.†

With regard to the Sunday opening of Museums, Mr. T. E. Powel moved the adoption of the following resolution:—

"That, in the opinion of this Congress it is desirable to support the opening of the national museums and art galleries on Sundays, wherever they exist, as an educational, elevating, and recreative advantage to the working classes."

He argued in favour of the motion on the ground of the educational value of such institutions, and contended that on that ground the working classes ought to be allowed all reasonable opportunities of visiting the public collections.

Mr. Freak (London) seconded the motion.

Mr. Hunter (Glasgow) proposed the following amendment:—

"That, in the opinion of the Congress, it is undesirable to augment Sunday labour by opening the national museums and galleries, but approves of their being opened on three or more days during the week between the hours of 6 and 10 p.m., to give the working classes facilities for visiting them."

He did not oppose the opening of museums on Sunday from a religious, but from a trade union point of view. He believed such an innovation would be detrimental to the best interests of the working classes, and that a vast amount of evil would be done by the introduction of Sunday labour.

Mr. Drummond (Glasgow) seconded the amendment, observing that with the advance of science and the improvement in the electric light they would soon be enabled to have museums and other places of recreation opened for the benefit of the masses on week-day evenings.

Mr. Hope (Edinburgh) was surprised to hear working men who had a half-holiday on Saturdays asking for places of amusement to be thrown open on the Sabbath.

Several other delegates having spoken on the question,

Mr. Broadhurst, M.P., said the Congress was instituted to protect workmen, and to do its utmost to lessen the hours of labour, and at all times and under all circumstances never to give countenance to any proposal likely to increase their labour. If houses were so bad that workmen could not possibly live in them on the Sunday, the duty of the Congress was to see that those houses were made better, and not open museums in order to oblige jobbers in property in London. Neither was it their duty to take lessons of labour from their friends across the Channel. God save Great Britain from ever adopting the French system of labour!

Mr. H. Slatter (Manchester) said that in that city the experience had been that, instead of an increase in hours of labour, there had been a diminution, inasmuch as the attendants, for the few hours they sacrificed on Sunday, received a day's holiday during the week.

After further discussion, the amendment was put to the meeting, when 67 voted in its favour and 51 for the original resolution.

With regard to harbours of refuge, Mr. Bevan proposed and Mr. Kelley seconded the following resolution:—

"That this Congress approves of the effort that is being made to expedite the construction of national harbours of refuge at the dangerous portions of the coast of the United Kingdom, with view to prevent, as far as possible, such great loss of life and property, and to add to the commercial and national security. It also desires to express the opinion that these and similar works of national utility and value may legitimately and advantageously be made the means of assisting to provide employment for the working population of the country, especially during periods of trade depression."

This was agreed to by the Congress without discussion.

The inspection of slate quarries was the next subject brought forward, and the following resolution was moved by Mr. Parry (Carnarvon), and seconded by Mr. Abraham:—

"That this meeting begs to express its surprise that such extensive works as the slate quarries of North Wales that are worked in the open,—the limestone quarries and workshops connected with the mining industry,—should have been left outside the proper Government inspection, and hereby begs most respectfully and earnestly to impress upon the Government to take those steps that might be found necessary to remedy this glaring defect in the supervision of this important industry."

The mover of the resolution drew attention to the fact that out of some 14,000 men employed in the Welsh slate quarries only about 5,000 came under Government inspection, while 9,000 odd were outside it, as they worked in the open. He hoped the Parliamentary Committee would draw the attention of the Government to the matter, and so rectify the inequality.

The resolution was unanimously adopted.

The following members were elected to serve on the Parliamentary Committee for the ensuing year, viz.:—Messrs. A. W. Bailey, Amalgamated Tailors (15,378 members); T. Birtwistle, East Lancashire Weavers (40,000); J. Burnett, Amalgamated Engineers (51,000); W. Crawford, Miners' National Union (40,000); J. Inglis, Associated Blacksmiths of Scotland (2,513); J. M. Jack, Associated Iron Moulders of Scotland (5,500); J. Mawdsley, Amalgamated Cotton Spinners (16,115); J. S. Murchie, Amalgamated Carpenters and Joiners (25,700); G. Sedgwick, Boot and Shoe Riveters' National Union (10,317); and H. R. Slatter, Typographical Association (6,388).

Saturday, the 12th inst., was the last day of the Congress. With regard to sanitary inspectors, Mr. T. Anderton moved the adoption of the following resolution:—

"That, in the opinion of this Congress, it is advisable that the number of sanitary inspectors be largely increased; but that no man be appointed without previously passing a thoroughly practical examination."

Mr. Forbes (Glasgow) in seconding the resolution, dwelt upon the necessity for the appointment of thoroughly practical men to the post of sanitary inspector, for the condition of the dwellings of the poor very much depended upon the technical knowledge possessed by the inspectors. The recent Royal Commission had shown the necessity for appointments such as those suggested.

Mr. Matkin (Liverpool) complained of the hardships which the present system imposed upon the working plumbers of this country. In Liverpool there were ten thousand houses in an insanitary condition, and he contended that there ought to be some thoroughly qualified inspectors appointed who possessed technical knowledge to inspect the drains of new houses before they were closed in. Unless this question was taken up, and some practical men appointed, the great evils attaching to the present system would not be recognised until some great calamity occurred.

Mr. Harris (Preston) said that from his experience persons appointed to the inspection of new houses were quite incompetent to say whether their sanitary condition was satisfactory.

On being put to the vote, the resolution was adopted.

The next question brought before the Congress was that of working-men magistrates, and on this subject the following resolution was moved by Mr. Rowland (London):—

"That while thanking the Government for the appointment of workmen as J.P.s, this Congress urges that the principle be adopted of workmen assessors to assist in all stipendiary magisterial courts when workmen's questions are before them, much in the same way as the constitution of the Wreck Commissioners' Court of the Probate Division of the High Court of Justice."

Mr. Richardson (Bolton) seconded the motion, which was carried.

Another resolution which was agreed to was the following:—

"That, in view of the conflicting opinions expressed by the magistracy to what is known as 'The Saving Clause' of the Conspiracy and Protection of Property Act, 1875, it be an instruction to the Parliamentary Committee, should any case arise in which the spirit of the said clause has been set aside, to take such steps as may by them be deemed necessary in order to obtain a legal definition of the said clause, by this means affording reliable information to the various trades affected."

The following resolutions were adopted without discussion:—

"That, seeing the increased amount of unemployed labour in the country, the Parliamentary Committee be instructed to induce the Government to bring in a Bill to regulate the hours of labour to all workers in the employ of the State and other public bodies, and that eight hours be the maximum working day in all their departments and workshops."

"That, in the opinion of this Congress, any one holding the office of agent to the Employers' Liability Assurance Corporation is not a fit and proper person to hold the office of coroner or his deputy; and it be an instruction to the Parliamentary Committee to take steps as early as possible to bring about an alteration of the law with regard to the election of coroner or the appointment of his deputy, or to take such steps as the committee may consider necessary for the carrying out this resolution. Believing that the present system of inquiry into the causes of death by courts presided over by district coroners is in many instances unsatisfactory, to ask the Parliamentary Committee to make a full inquiry into the subject, with a view of having the composition of the courts altered."

"That the Parliamentary Committee be instructed to take the necessary steps, by deputation to the Lords of the Treasury in conjunction with the Registrar-General, or by other means, to secure the same charges for certificates of death to members of trade unions as are charged to members of friendly societies."

"That, in the opinion of this Congress, the adoption of the eight hours system would largely benefit the working classes, by giving work to many of those presently unemployed, and thereby relieving the existing depression of trade."

With the adoption of one or two other resolutions, the work of the Congress was brought to a close.

Lifts.—Messrs. Archibald Smith & Stevens have just completed, for the Countess de Torre Diaz, at her residence, 21, Devonshire-place, one of Stevens' and Major's Patent Hydraulic Lifts, worked from a tank in the roof, so that it is available night and day. This lift is perfectly noiseless.

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* See p. 354, *ante*.

† It appears, therefore, that among other special privileges which artisans arrogate to themselves is that of having no inquiry made about their character by those who engage them!

A NEW SURVEYING INSTRUMENT.

FROM time to time announcements are made of the discovery of new scientifc instruments which profess to perform some wonder or other in the way of simplifying the labours of the investigator, or of lightening those of the more practical engineer or surveyor. Too often a trial of the instrument, or even a critical examination, shows that the profession is profession only, and that, even if the principle of the machine is unimpeachable, it is either a scientific toy, useless, for some reason or other, for practical purposes; or, on the other hand, is, as a matter of fact, more clumsy in its operations than are the old instruments in skilful hands. This does not seem to be the case with a new surveying instrument invented by Professor Dr. Luigi Cerebotani, of the Verona University, and called by him the Universal Teletopometer. With this instrument the Professor claims to be able to measure distances and heights from one station, without the aid of a chain or the necessity of trigonometrical calculations,—and this with an accuracy represented by a maximum error of a half per cent.,—and, moreover, to plot his survey at the same time by an automatic arrangement on a drawing-board attached to the stand of the machine. The instrument itself consists essentially of a horizontal and perfectly rigid steel bar, with horizontal and vertical movements, and to the ends of which are attached astronomical telescopes, one fixed and the other movable in a horizontal plane, both on a pivot and forwards and backwards. The distance between the optical axis of the fixed telescope and the centre of the pivot becomes the base of a triangle, the apex of which, when an observation is being taken, is the object the distance of which is required.

The peculiarity of the instrument is that its movements record, not the angle taken by the movable telescope, nor any of its trigonometrical functions, but the length of a line parallel to the axis of the fixed telescope, and which forms the side of a triangle similar to the larger one, and the base of which is an aliquot part of the larger base. The length of this line is read with great exactness by the aid of a micrometric screw, and, on reference to a table attached to the instrument, gives the length of the parallel line from the telescope to the object. The distance being known, the height is ascertained in the ordinary way by taking a vertical angle and multiplying the distance by its natural tangent. Attached to the pivot of the instrument, and moving over the surface of a horizontal drawing-board, is a steel straight-edge, the edge of which, moving with the bar of the instrument, is always parallel to the direction of the object under observation, and bears a metrical scale, by means of which its distance may be marked off as soon as found; thus, with a rapidity beyond any possible comparison with that of the ordinary processes, the relative position of any number of points within the range of the instrument,—which depends only on the distance which separates the telescopes,—may be found and plotted, and, if desired, their height relatively to the level of observation may be noted beside them.

For rough surveys, such as are often required for military purposes or for valuing standing crops, we believe the usefulness of the instrument will be at once recognised. A trial, which took place on Friday, the 11th inst., on the Thames Embankment, gave very satisfactory results, and we hear it is being tested by the Woolwich authorities, and that it has been adopted by the German War Office, so that it comes to us well recommended; but for purposes where great accuracy is necessary we fear that the expressed hope of the inventor that it will supersede theodolites and trigonometry is doomed to disappointment. Dr. Cerebotani himself confesses its liability to an error of 18 in. in every 100 yards, and when the shortness of the base-line and the liability of metal to be affected by temperature are taken into account, we do not think this estimate excessive; besides, even if that were the maximum, it would still, we fear, be too great to satisfy the conscience of most surveyors.

Wolverhampton.—A carved oak lectern has been presented to St. Mark's Church, Wolverhampton, by an anonymous donor. The work has been carried out by Messrs. J. & W. Cockerill, from a design by Mr. J. R. Veall, architect.

SANITARY CONGRESS AT LEICESTER.

THE following is the order of proceedings to be observed at the Sanitary Congress to be held at Leicester next week:—

Tuesday, September 22nd.—12.30 p.m., Reception by the Mayor at the Town Hall.—1 p.m., Public Luncheon.—3 p.m., Opening of Exhibition, Floral Hall, Belgrave Gate, by the Mayor.—8 p.m., First General Meeting: Opening Address by Professor F. S. B. F. de Chaumont, M.D., F.R.S.

Wednesday, September 23rd.—**Breakfast** to members of the Congress by the Leicester Temperance Society, Temperance Hall, 8.30 a.m.—Section I.—"Sanitary Science and Preventive Medicine": 10.30 a.m., Address by Mr. Arthur Ransome, M.A., M.D., F.R.S.; 11 a.m. to 1 p.m. and 2 to 5 p.m., Papers and Discussions, in the same section; 8 p.m., *Conversazione* at the Museum.

Thursday, September 24th.—Section II.—"Engineering and Architecture": 10.30 a.m., Address by Mr. Percival Gordon Smith, F.R.I.B.A.; 11 a.m. to 1 p.m. and 2 to 5 p.m., Papers and discussions in the same section; 8 p.m., Lecture to the Congress, by Mr. Ernest Hart, M.R.C.S.

Friday, September 25th.—Section III., "Chemistry, Meteorology, and Geology": 10.30 a.m., address by Mr. William Marcet, M.D., F.R.S.; 11 a.m. to 1 p.m. and 2 to 4 p.m., papers and discussions in the same section; 4.30 p.m., closing general meeting of Congress.

Saturday, September 26th.—Excursions during the day; 8 p.m., Lecture to the Working Classes, by Captain Douglas Galton, F.R.S.

The lectures to the Congress will be held in the Temperance Hall, Granby-street. The sectional meetings and the general meetings will be held in the Municipal Buildings.

The exhibition will be held in the Floral Hall, Belgrave-gate, and will remain open until Saturday evening, October 10th.

CASE UNDER THE METROPOLITAN BUILDING ACT.

CONCRETE BUILDING.

MR. HENRY GOODWIN, builder, of Burghley House, Blackheath-hill, was last week summoned before Mr. Bridge, at the Southwark Police Court, by Mr. E. R. Hewett, one of the District Surveyors of Southwark, for unlawfully constructing the walls of the artisans' dwellings in Zoar-street with concrete, contrary to the Metropolitan Building Act, 18 and 19 Vic., cap. 122, sec. 40, and without licence from the Metropolitan Board of Works. Mr. Duke, barrister, prosecuted, and Mr. Arthur Reed appeared for the defence.

Mr. Hewett said that the defendant was building the artisans' dwellings between Zoar-street and Cashers-ground, in St. Saviour's. They were to be five stories high, and the walls should have been of brick and stone. On the 8th of August witness found that the defendant was using concrete for the walls, and on the 15th he served him with notice to discontinue it, as the Metropolitan Board of Works had refused a licence to use it. Witness received a letter from the defendant stating that under advice he should proceed with the buildings.

In answer to Mr. Bridge, the witness said he had inspected the buildings going on and found that the concrete was put on in squares. It was quite solid and firm. The defendant had been refused a licence to use concrete.

Mr. Bridge was of opinion that concrete was a good material for building purposes if properly used, and he thought the Board ought to have sanctioned it. The Admiralty Pier at Dover, and other substantial buildings, were constructed of concrete.

Mr. Duke submitted that the Act specified that the buildings should be erected in a substantial manner of brick and stone. Concrete was not known when the Act was passed, and the Board did not think it to be of sufficient substance to be safe, consquently they refused the licence to the defendant.

Mr. Reed, on the part of the latter, said that no licence was required, and he thought it very unfair of the Metropolitan Board to interfere in the matter, as they had done. He had witnesses in court to prove that the concrete was properly done, and that the buildings were being substantially erected.

Mr. Hewett was recalled, and in answer to Mr. Bridge said he had seen the buildings going on. The walls were 9 ft. high, and seemed very strong and substantial.

Mr. Bridge asked if the Board had any objection to the defendant going on with the building if in a proper manner?

Mr. Duke said the Board had refused the licence and the defendant should discontinue using the concrete.

Mr. Bridge observed that it appeared to him that the buildings were being constructed in a proper manner; therefore he dismissed the summons.

CITY OF LIVERPOOL LABOURERS' DWELLINGS COMPETITIONS.

SIR,—The resolution arrived at by the Insanitary Property and Artisans' Dwellings Committee, and published in your last issue [p. 378], is another specimen of the very highly unsatisfactory results obtained by competition where an independent professional referee is not called in to advise and assist the committee in selecting and adjudicating upon the designs submitted by the competitors.

Surely if "some of the plans submitted show considerable merit," the gentlemen who have prepared these designs, at a very considerable expense and trouble, have earned the paltry premiums offered by the wealthy Corporation of the City of Liverpool, and I trust that they will, one and all, combine and, if necessary, form a deputation to wait upon the Council, as to the gross injustice of the resolution arrived at by the Insanitary Property and Artisans' Dwellings Committee.

OPTIMUM QUOD PRIMUM.

IRON FENCE FOR HOVE SEA-WALL.

SIR,—It will be within the recollection of your readers that a few months back the Hove Commissioners advertised in the *Builder* for designs and estimates from contractors who were willing to supply and fix an ornamental iron fence along the new sea-wall. In consequence, many, besides myself, were induced to prepare special designs, which were duly submitted under "motto."

After some delay, the writer received notice that one of the designs submitted by him had been selected with others for a final competition, fresh particulars being given of a more definite character, entailing amended drawings.

From that time until to-day we have been waiting to learn the decision of the Commissioners; and from a paragraph in an article in your current issue it appears that the railing is being supplied by the "local" man. Comment is unnecessary.

J. JEFFREYS.

*** We have received other letters complaining of the treatment of the competitors in this case.

BROUGHTON CASTLE.

SIR,—It may interest your readers to know that your view of Broughton Castle, published in the *Builder* of Saturday last, is of great historic importance. In the upper room of the left-hand gable, shown above the roof, the leaders of the Parliamentary party in the seventeenth century met repeatedly in secret conclave to discuss the political situation, and to circumvent as far as possible the arbitrary acts of Charles I. Here in the ancestral home of the Fiennes, Lord Brooke, Hampden, Pym, and other leaders, discussed the state of affairs, and laid down that plan of action which culminated in the Civil Wars and the execution of Charles I. The windows of the room commanded extensive views over the surrounding country, which enabled the watchers to observe the approach of any hostile party. To guard against spies, eavesdroppers, or treachery within, there was, and indeed is now, an elaborate arrangement of doors and vestibules ingeniously contrived to prevent the possibility of any unauthorised person approaching the chamber. When the future Shakspeare writes the great drama of "The Commonwealth," the opening scene ought to be laid in this room.

J. TOM BURGESS, F.S.A.

IRON CHIMNEY-SHAFTS.

SIR,—Will you please allow me to ask if any of your readers will kindly give me some particulars of factory chimney-shafts made of sheet iron?

I want to know about thickness of plates used, size of rivets, cost, and any other information respecting the construction of wrought-iron shafts.

O. F.

The Mersey Tunnel Railway Stations. We are informed that after much consideration the engineer and architect for the Mersey Tunnel Railway Company (having in view the expected enormous pedestrian traffic through their stations, estimated at millions per annum) have decided to adopt Lowe's Patent W[illegible] Block Flooring for the booking halls, waiting-rooms, offices, &c., of their new stations, and the work is just being taken in hand.

PROVINCIAL NEWS.

Oswestry.—The Mayor of Oswestry (Mr. W. Fletcher Rogers) is having some model cottages erected in Oswestry from designs by Mr. Reginald Pinder, F.R.I.B.A., of Bournemouth. Each house has, on the ground-floor, parlour, kitchen, scullery, wash-house, larder, water-closet, and ashpit; and on the chamber floor three bedrooms and hanging cupboard. There are bells in each house, and gas and water are laid on. The waterclosets are to be fitted with Farmiloe's "Eos" patent closets and flushing cisterns. The drainage system is said to be perfect, its ventilation being on the principle of atmospheric exhaust and in-draught, and inspection chambers are provided. Tile paving is used for porches, passages, kitchens, and sculleries. Each house will have a good garden at the back and a flower-garden in the front, fenced with brick wall, with stone coping and iron railing on the top. The elevations are of red brick, and in the English half-timbered style. The cottages will cost about 230*l.* each. Messrs. W. & G. Thomas, of Oswestry, are the builders.

Bognor.—A new building estate has recently been opened up at this watering-place on the South coast. The owners in March last entered into a contract with Mr. George Newman, of King-street, Deptford, to lay out about a mile and a quarter of new road, to be known as "The Victoria Drive." Drains have been laid, and paths formed, and every provision made for the erection of villa residences. The works have been carried out under the directions of Mr. W. L. Barrett, C.E. A contract has also been entered into between the Bognor Assembly Rooms Company (Limited), and Mr. George Newman, for the erection of a detached block of buildings, containing a large hall, 75 ft. by 45 ft., lecture-room, reading-room, and offices generally. The estimated cost of the works is nearly 4,000*l.* Rowland Castle bricks with Bath stone dressings are being used, and the works are progressing. Mr. Arthur Smith, of Bognor, is the architect, and Mr. Marshall is acting as clerk of works.

Winslow (Bucks).—A very large new church clock has been erected at Winslow, Buckinghamshire. It chimes the Cambridge quarters, strikes on a 20 cwt. bell, and shows time on three dials, each 6 ft. across. It is also fitted with special machinery for playing a tune every three hours. It has a gravity escapement and 2 cwt. pendulum compensated for changes in the temperature. The whole has been carried out by Messrs. John Smith & Sons, Midland Clock Works, Derby, who have also just erected a large stable clock at Ormerod House, near Burnley, and one at Messrs. Allsopp & Sons', Burton-on-Trent, which strikes the hours and has two illuminated dials.

CHURCH-BUILDING NEWS.

Rhyl.—Lord Richard Grosvenor, M.P., lately laid the chief foundation-stone of St. John's Church, Rhyl. The designs for this proposed new edifice were selected by the Building Committee, in a limited competition between several well-known ecclesiastical architects. The instructions and aim of the committee were to provide a church in which the entire congregation could easily follow the service without any let or hindrance from piers, columns, or other obstructions. This object has been attained by what may be termed the central area type of edifice, as opposed to the ordinary nave and side-aisle idea. The church consists of one large nave, 77 ft. by 56 ft., the centre forming an octagonal dome, embracing the full width of the church, a bay at the western end being prolonged to form a nave arcade and aisle, the chancel at the east end being 33 ft. by 26 ft., and having an organ-chamber on the south side, and choir and clergy vestries upon the north side. The main-entrance porches are at the west end, arranged upon the north and south elevations. The interior is lofty, being 50 ft. from the floor-line to the ceiling-line of domical roof, and 40 ft. from floor-line to ceiling-line of chancel. The style of architecture adopted is that of the Early Decorated period, designed to suit the peculiar requirements of the plan and the local materials adopted in construction. The walls are of a massive character, and are to be built in Ochre Voel limestone, the dressed work being in Gwespyr freestone, from the contractor's quarries. The internal woodwork will be unvarnished pitch-pine, and floors laid in wood-block paving. The contractor is Mr. Alfred Torkington, of Rhyl. The first contract for shell of nave is 3,000*l.* The architect is Mr. David Walker, of Dale-street, Liverpool. The edifice, when complete, will cost 5,500*l.*

Beeston.—The ancient Church of St. Mary, Beeston, having proved itself inadequate to the wants of the growing congregation, and the walls, particularly that on the north, having become unsafe through great age, a meeting of the parishioners was held last January, when it was resolved to build a new nave to the church forthwith. The new church, which will give an increase of 100 sittings over the old church, making altogether (including gallery for scholars) accommodation for 450, has been designed by Mr. C. H. Thornton, of Leeds. The design is Early English, and is made to harmonise with the chancel and organ-chamber built some eight years ago from the designs of the same architect. The plan consists of nave, 64 ft. by 26 ft. within the walls, with an altitude of 39 ft. to the apex of the ceiling, the roof up to this point being open, with dressed and unvarnished pitch-pine principals, with curved braces, moulded collars, and king-posts and rafters, spars, and match-boarding. The nave is in five bays, and clearstoried. There is at the south-west corner a turret for clock and bell rising to a height of 63 ft., a doorway in the west wall thereof giving access to gallery for 100 scholars. All the roofing is covered with dark Westmoreland slating and stone roll ridging. All windows will be glazed with tinted cathedral glass in lead-work. Externally for the dressings fine sandstone will be procured from Horsforth, and the wall-stones, which are pitch-faced, from Potternewton. Internally the walls are to be plastered. The contractors for the work are:—For mason and general builders' work, Messrs. J. W. Wood & Sons, Churwell; carpenter and joiner, Messrs. J. Tomlinson & Sons, Leeds; slater, W. Atkinson, Leeds; plumber, T. Story, Leeds; plasterer, W. J. Haddock, Armley; and painter, W. Greenwood, Leeds. The total estimated cost of the work is 1,500*l.*

Upleatham.—Upleatham Church has been re-opened, after alterations which have been made at the sole expense of the Earl of Zetland, from designs and under the superintendence of Messrs. Clark & Moscrop, architects, of Darlington. Mr. Harwood, of Manfield, was the contractor employed.

Llangranog (Cardiganshire).—A new church, capable of seating 210 worshippers, designed by Mr. E. H. Lingen-Barker, of Hereford, and raised in memory of the late Captain Jordan, of Pigeonsford, was consecrated by the Bishop of St. David's on the 8th inst. It consists of a nave, 38 ft. 6 in. by 17 ft. 6 in.; chancel, 21 ft. by 17 ft. 6 in.; south porch, and north vestry, the west end being provided with a double bell gablet. The walls are carried out in local grey stone, with windows and other dressed stone-work of Box ground. The chancel roof is wagon-boarded, and the others plastered between the timbers, the whole being covered with North Wales slates. The church is fitted throughout in varnished pitch-pine. The glazing was executed in cathedral rolled tinted glass by the late Mr. Ben Gay, of Bristol. One of Porritt's stoves is provided. The nave passages are floored with Webb's Worcester tiles, and the chancel with Maw's encaustic ones. The stone carving has been executed by Mr. Herridge, of Cardiff, the contractor for the general work being Mr. Edwin Giles.

STAINED GLASS.

Hamworthy.—A two-light stained-glass window, by Messrs. Mayer & Co., has lately been erected in Hamworthy Church, representing "Faith and Hope."

Halifax.—A three-light Munich stained-glass window, representing the Angel appearing to the women at the Sepulchre, has just been erected in the fine old church of Halifax to the memory of Mr. and Mrs. Norris, of Fixby Park. The upper and lower portions are filled with Perpendicular canopy work, in accordance with the architecture of the church, while in the base of the central light is introduced the arms of the family. The work is from the studios of Messrs. Mayer & Co.

Cullompton.—A stained-glass window has been placed in Cullompton church by the nephews and nieces of Mr. Henry Hill, with a commemorative inscription stating that he was born in the town of Cullompton, 1812, and died at Brighton in 1882. The window is of four-lights, with the lace-like stone tracery for which this church, and especially "Lane's Aisle," is notable. In the four large compartments are eight subjects designed to illustrate the career of St. Peter, and the tracery is filled with angels holding scrolls and emblems appertaining to the Saint. The whole has been executed by Mr. F. Drake, of the Cathedral-yard, Exeter.

Crosby-on-Eden.—A three-light Munich stained-glass window, representing "The Sermon on the Mount," has just been placed in the Church at Crosby-on-Eden, Carlisle. The artists are Messrs. Mayer & Co.

Books.

The Law relating to Building, Building Leases, and Building Contracts, with a full Collection of Precedents. By ALFRED EMDEN, Barrister-at-Law. Second edition. London: Stevens & Haynes. 1885.

THIS is a considerably-enlarged second edition of Mr. Emden's work on Building Law, which has been for some time favourably known as a useful compendium of the law on this subject. Such a subject, indeed, does not permit of an author concluding a concise work, because if all the details of it are gone into it touches upon nearly every branch of municipal law. The principles of the law of contracts are involved in every building agreement, and the principles of equity in regard to building leases and building covenants. Nor is any subject more largely influenced than this by the statute law, when it is borne in mind that it is affected by the several Metropolitan Building Acts, for example, and by the Public Health Act.

Perhaps this notice will be most useful to our readers if we point out, in a few words, how this work differs from previous editions. It is much larger. In some ways this will lessen its utility, especially to those who are not lawyers, who require a work more of a handbook in its character. For a layman to have to hunt through a law-book of nearly 1,000 pages is a task which he would rather leave to a lawyer. Chapters on Gas and Water, Support, Party Walls, and Light are among the new chapters. Among other additions we also find the Metropolis Management and Amendment Act, 1882, with numerous notes by the author. The annotated appendix of statutes is, indeed, as useful a part as any of the work. The chapter on support could hardly have been omitted from this new edition after the decision of the well-known case of Angus *v.* Dalton, upon which we commented from time to time during its progress through the several law courts. The chapter in question clearly states the law as it now exists, but, like all this book, what is said might have been put more concisely and yet with equal clearness. Diffuseness is the cardinal sin, indeed, of which Mr. Emden is guilty; for example, to leave this chapter for a moment, Chapter VII. is headed "The Construction of Buildings." It consists of thirteen lines in the middle of a blank page. The first four lines are, practically, what would occur to the author arranging his materials, and are of no interest to the reader, who can see for himself in what order the several incidents arise. The rest might have been put in a note at the beginning of the following chapter. Again, to return to the chapter on Support. Some lines on p. 477 are occupied with a point which was in doubt before Bonomi *v.* Backhouse was decided. It would have been enough to have told us the effect of this case. Unquestionably the perusal of this chapter will show how considerably in the last few years the position of the owner of a dominant tenement has been strengthened and cleared up, not only in regard to the support of buildings by land, but also in regard to the support of buildings by adjacent buildings. The two cases, indeed, of Angus *v.* Dalton and Lemaitre *v.* Davis are perhaps, the two most important in regard to buildings which have arisen within the last ten years. We have said enough to show that Mr. Emden's work is a most useful and comprehensive "compendium" of building law. It has its faults, no doubt, but these are not of such importance as to prevent the work from being one which will be of practical use to lawyers and laymen concerned with the subject of buildings.

The Steam Engine: its Theory and Action. By W. H. NORTHCOTT, M. Inst. M.E. London: Cassell & Co. (Limited).

OUT of the multiplicity of books on the steam engine this is not by any means the worst. The author has succeeded in condensing in a very moderate space,—in conjunction with his own deductions,—a very considerable amount of the generally admitted theories and facts connected with the steam engine. He has, moreover, written in a clear style, and gives us a book easily understandable by the non-mathematician, a decided advantage to many interested in the steam engine who have not the time, and perhaps not the knowledge, to work out the more or less accurate, but certainly very intricate, formulæ with which some works abound. The book commences with a short history of the invention of the steam engine, but, as this has already been repeated *ad nauseam*, we think it might very well have been omitted. A few neatly-put remarks on the "Origin of Force" follow, and the author deduces, what we believe no one disputes, that, considering the small proportion of the latent force embodied in fuel, which is turned into useful effect by the aid of the steam engine, it must be held in its present condition to be a very imperfect and uneconomical machine.

Chapter II. deals with the combustion of fuels and the thermal and dynamical value of combustion, and sets out in a concise manner some of the generally accepted, but not altogether proved, theories on the subject. We note the results of the experiments of Bunsen and Deville on the temperature of combustion are quoted. They place the temperature attained by undiluted hydrogen and oxygen at about 6,000° Fah., or about half the temperature calculated by the usual formula,—a very considerable margin, to say the least.

In speaking on the furnace combustion of fuels, the author asserts that anthracite coals are preferred for steam generating purposes to the bituminous coals; this statement requires, at any rate, modification. We presume the author does not refer to pure anthracite coal, but to anthracite which contains bitumen to a greater or less extent, but he does not say so. Should he refer to pure anthracite coal,—although it is practically speaking smokeless and evolves a great heat,—he must be aware of the difficulties attending its combustion,—such as burning of fire-bars, boiler plates, &c.,—that have hitherto prevented its general use. We may add, the most successful plan of burning anthracite in a furnace that we have seen is by the use of a water hearth, but before anthracite coal comes into general consumption for steam generating purposes many modifications and improvements in furnace construction will have to be made.

Further on the author says it is essential "that the layer of coal upon the fire-bars should not be too thick or the air will be unable to pass through it." This generalising is all very well, but we should have been glad to have heard what thickness of fire the author recommends for various types of boilers, premising, as he does, that the best quality of steam coal is used: this is information that might be of practical service to his reader. The author's remarks on stoking are not new, but they are satisfactory, and we agree with his remark that it is a bad practice to damp small coal before putting it on the fire. We may add that some experiments have recently been made in this direction, and with small coal containing 18 per cent. of water, 9 to 10 lb. of coal evaporated 5 1-10 lb. of water per pound of fuel. The same quantity of coal containing only 3 per cent. of water evaporated 8 to 8½ lb. of water per 1 lb. of fuel; it will be seen, therefore, that wet coal loses from 15 to 20 per cent. in evaporative efficiency.

On page 57 the author tells us there is such a thing as "priming" in steam boilers, and gives some of the generally accepted reasons for it; but why not make the matter more complete and his remarks more serviceable by telling us some of the remedies for "priming"?

The faults of this book are almost entirely those of omission, and may arise from trying to "boil down" a very wide subject into a small space, but as far as it goes the book is decidedly a good one, and can safely be placed in the hands of young engineers and others desirous of obtaining, within a small compass, a good general idea of the theory and action of the steam engine.

Reports of Appeals heard before the Court of General Assessment Sessions, from the year 1871 *to* 1885. By EDWARD RYDE and ARTHUR LYON RYDE. The fourth edition brought down to the present date. With an Introduction to the Valuation (Metropolis) Act, 1869, by WALTER C. RYDE, Barrister-at-Law. London: Crosby Lockwood & Co. 1885.

As this is the fourth edition of these Reports, it can scarcely need recommendation, for it is obvious that the work is of practical use to those engaged in rating appeals. But we must dissent from the editor when he tells us in the preface to this edition that "the value of a volume of Law Reports depends mainly in facility of reference." It is really unnecessary to point out that this is but one of the features which tend to make a volume of Reports useful. But taking the editor's own test, is not some kind of head-note at the beginning of each case one of the most important ways of facilitating reference to a case? But the cases are merely headed with the names of the parties, then the names of counsel appear, and it becomes necessary to go quite through the case in order to discover what is the point of the decision. In some instance no direct decision is given, and we doubt the value of cases in which this occurs. The essay on the Valuation Metropolis Act, 1869, enhances the value of this collection, which, though in form it falls far below the standard to which a volume of law reports should attain, is no doubt a useful collection of cases.

British Dairy Farming. By JAMES LONG. London: Chapman & Hall.

THE author of this work is well known to the readers of the *Field*, in which he has, under the *nom de plume* of "Merlin," for years treated of the "Farm and Farming" in its many aspects. The present book deals not only with English dairy-farming, but with that of France, Denmark, Holland, Switzerland, &c., every process being clearly described and its appliances enumerated. Chap. XIII. treats of the disposition and construction of the buildings forming a typical dairy, and gives practical information which the architect who has the delightful task of designing a model dairy,—the daintiest of all apartments,—will find invaluable. A point which may be noted is the proved superiority of a slate over a tile floor: the former absorbing only 1-200th of its weight of water as against one-seventh absorbed by the latter, and drying in one-quarter of an hour as against six days required by the tile. This information is given on the word of a bishop, and should therefore be received without question. The illustrations are numerous and good, and the whole book is evidently the work of a man who is quite master of his subject.

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

6,264, Bridges. H. Lake.

The girder is constructed of a number of interchangeable parts. The longitudinal and diagonal bars have eyes at their ends through which are put the ends of the cross-bars. Two framings may be used, one within the other. The same parts may be used in the construction of arched bridges by arranging them as interlocking links.

6,918, Concrete Building and Slabs for same, &c. F. and J. R. West.

The walls consist of a shell of concrete slabs panelled on the inner face, the recessed parts being undercut. The slabs are formed with grooves and mortices in their edges, by which they are connected together by cement dowels. The interior of the wall is filled with concrete. Slabs for ceilings are made with dovetailed grooves, by which they are suspended from the flanges of the floor joists. Special slabs are also described for the junction of two walls, for quoins, sets off, &c. The moulds are faced with vulcanite, so that the slabs shall leave easily. Moulded ornaments already set may be embedded in the plastic slab where required. When these slabs are used, the temporary boarding usually required for concrete building is dispensed with. The method is applicable to circular, domical, and pyramidal as well as to ordinary constructions.

7,268. Ventilator. J. Thomasson.

In the wall of the room to be ventilated, is arranged a casing, in which fits a conical valve provided with a spindle whereby it may be raised or lowered, a weight holding it at any desired height. The top part of the casing is vertically divided by open wedge-shaped partitions forming air passages inside and open slots outside. The inflow of air is divided by partitions into numerous currents which mix with the induced currents of warm air passing from the room up the before-mentioned slots.

8,927, Windows. T. Tobitt.

The sash is provided with a bolt near the bottom, the case of which projects into a groove in the pulley stile. Beads are dispensed with, a strip of metal running into grooves in the sash and stile serves to guide the window. When the window is pulled down the bolt may be shot into a recess at the back of the groove and the guiding strip removed, the sash may be then turned on the bolt as a pivot.

9,025, Floor or Wall Covering. S. Loewenthal.

A composition, of which African flake is the chief ingredient, is spread on a thin layer over any fabric or paper. It is then printed and embossed, and afterwards hung up and exposed to heat. It is especially adapted for wall-coverings, imitation leather, or floor-cloth.

9,886, Glazing. T. W. Helliwell.

The bar is made with several shoulders on each side, in which are water-grooves. A groove is made in the upper part of the bar, into which a folded strip of lead is slidden, having its free edges standing above the bar. The glass rests on one of the shoulders, and is secured by the lead being bent over it. Pieces of felt may be put in the angle between the lead and the glass and bar, in which case stiffening angle-bars of metal are also inserted. The shoulders and water-grooves may be formed in sheet metal surrounding a cone of wood or iron.

9,888, Colouring Stone. L. de Liebhaber.

Certain stones, such as Bath stone and yellow sandstone, are changed in colour, especially to red or pink, by the action of heat. The blocks of stone are immersed in or floated upon melted lead or a fused alloy, contained in a tank of convenient size, for a sufficient time, and are turned from time to time. The temperature of the bath is determined by the nature of the stone. A furnace or oven may be used instead of the heating tank of lead. Stone thus treated may be ground to a red or pink powder, and used in place of hearthstone.

APPLICATIONS FOR LETTERS PATENT.

Sept. 4.—10,468, Perrot & Habershon, Sliding Canopy Stoves.—10,476, W. B. Haigh, Improvements in Machines applicable to Planing Wood.—10,479, J. Hansen, Automatically Regulating the Temperature of Hothouses, Workshops, &c.—10,480, W. G. Margetts, Improvements in Loading Cement Kilns.—10,488, H. C. Chocquel, Improved Screw-driver.—10,514, E. Wood, Improvements in Ventilators.

Sept. 5.—10,538, Geraud & Nee, Gas-burner, with Electric Ignition.—10,544, M. Parrington, Improvements in Kilns and other Structures employed in the Manufacture of Lime and Cement.

Sept. 7.—10,548, T. Taylor and Another, Blind Cord Brackets.—10,571, D. S. Keith, Water Supply Apparatus for Water-closets, &c.—10,581, W. H. Tonks, Improved Letter-box.—10,585, G. Boutchard, Improvements in Kilns.—10,586, W. Pope, Ventilators for introducing Fresh Air without Draught.

Sept. 8.—10,599, W. Young, Closets for Indoor use.—10,605, J. Moore and H. Salomon, Combined Table and Writing-desk.—10,625, J. Vaughan, Water-saving Flushing Cistern.—10,640, J. Morison, Device for Lowering Venetian Blinds.—10,643, M. Syer, Improvements in Flushing Cisterns.

Sept. 9.—10,659, H. Sainsbury, Spring Air Apparatus for Closing Doors and Gates.—10,668, H. Moody and J. Pope, Roofs or Coverings for Houses.—10,669, C. Edwards and W. Richard, Combined Flush and After-flush Cisterns for Closets.

Sept. 10.—10,717, S. Henshaw, Securing Doors and Windows by a Self-acting Box.—10,721, T. Mercer, Collection and Storage of Rain-water from Roofs, &c.—10,740, G. Butchard, Kilns for Burning Cement.

PROVISIONAL SPECIFICATIONS ACCEPTED.

8,958, C. Ching, Apparatus for Ventilating Rooms, Buildings, &c.—8,968, W. Buchan, Improvements in Water-closets.—9,297, B. Mills, Improved Joint for Pipes.—9,322, C. Howe, Improvements in the Manufacture of Keene's Cement.—9,730, W. Wood, Compound for the Manufacture of Furnace Bricks and Linings.

COMPLETE SPECIFICATIONS ACCEPTED.

Open to opposition for two months.

14,430, A. B. Joy and J. Lewen, Manufacture of Imitation Marble.—14,744, A. Brenker, Fret Saws.—14,888, F. Wilcox, Improvements in Ventilators.—15,120, R. H. and R. S. Hughes, Improvements in Hall Lamps, &c.—15,460, E. De Pass, Preparing Tiles, Slabs, or Flags in Panel form for use in Ceramic Facings.—15,758, J. Bartlett, Stencils and Stencil Frames.—16,290, T. Jones, Stanchions for Supporting the Roofs of Buildings, &c.—8,737, W. Lake, Improved Paint or Pigment.—9,165, W. H. Beck, Improvements in Water Waste-preventing Apparatus.—14,115, A. Carey and E. Latham, Machinery for the Manufacture of Concrete and Mortar.—14,712, J. Moeratti, new Method of Building a Fireproof House.—15,464, J. Lorrain, Ventilating Apparatus.—9,379, S. Furnival, Composite Moulds for Moulding Plastic Articles.

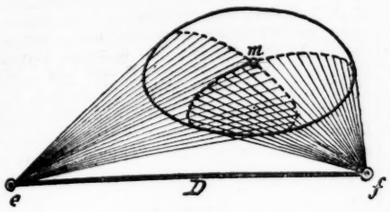

Fig. 162.

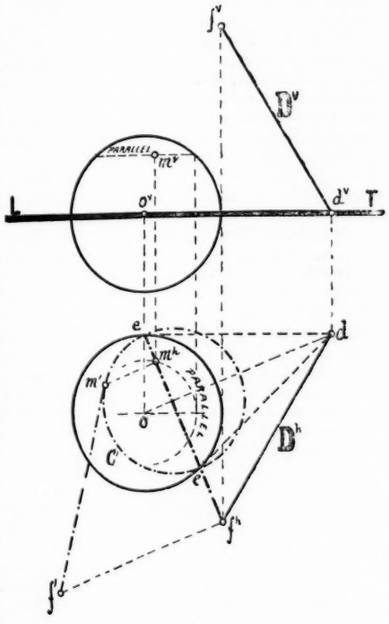

Fig. 163.

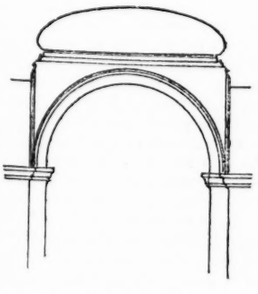

Fig. 164.

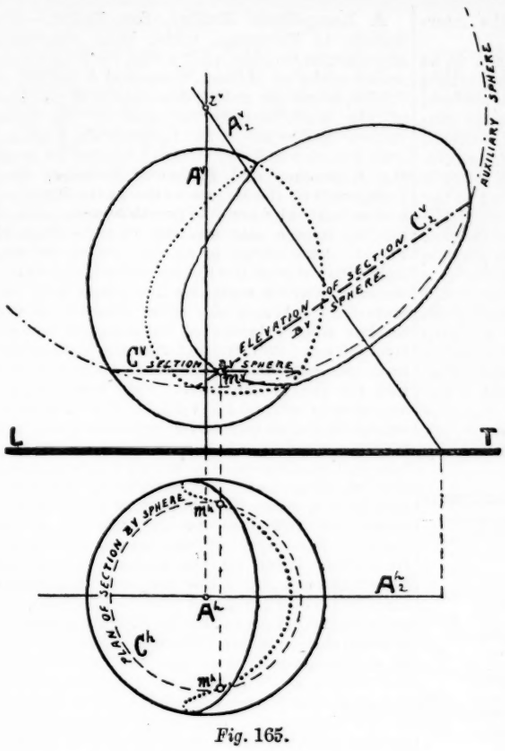

Fig. 165.

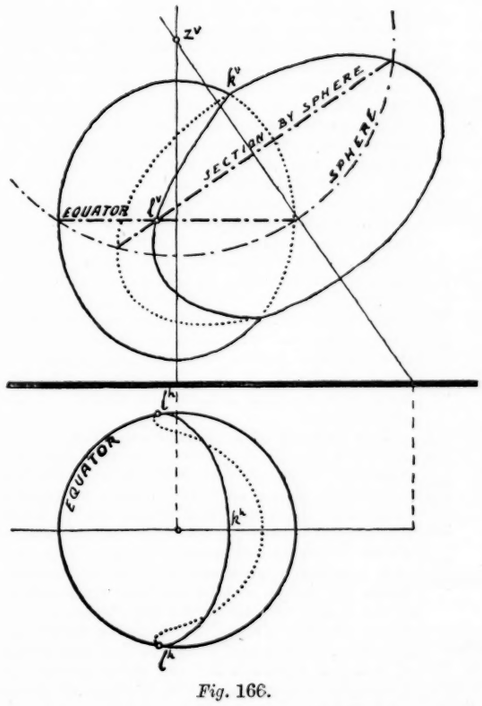

Fig. 166.

(Note that the points *o* and *d* of the plan are not projections but the points themselves, and, therefore, do not receive the sign ^{h}). In the way we have set the problem the above circle of contact is vertical, and, therefore, the plan of this circle is a straight line *e e*. If we turn down the plane of the said circle round its trace *e e* we shall be able to draw it on the plan as the circle C^1 of diameter *e e*. We turn down also with the plane of the circle the point *f*, where it is penetrated by the line D, and we get it on the plan in f^1; we need only take a tangent to circle C^1 to get the point m^1, the position on the turned down plane of one of the points of contact required. When the plane of the circle is turned back to its former position the point m^1 has m^h for its plan. To find the elevation of the point we draw the parallel of the sphere on which it is situated, an operation so easy that we need not describe it, and carry thereon the elevation m^v. (See fig. 163.)

Find the intersection of two surfaces of revolution the axes of which are in the same plane.

The penetration of a cupola by a circular archway would be one special case of the intersection of surfaces of revolution, so would be the intersection of two cupolas; but we will treat the question in its most general form by selecting for the one surface of revolution an elongated ellipsoïd such as an egg, and, for the other surface an ellipsoïd generated by an ellipsis revolving round its minor axis, such as the surface of the old-fashioned watches, vulgarly called turnips. It was the practice of the late Sir Charles Barry to use such ellipsoïds as cupolas to crown pendentives when used, as he was so fond of doing, in internal corridors. He called them watch-glass cupolas, and pointed out their advantage of receiving a shadow round their edge which augments their apparent height (see fig. 164). Generally, we can say that, for domes and cupolas, ellipsoïds are always to be preferred to spheres, as the latter are deformed in appearance by optical causes which do not affect ellipsoïds.

The axis A_2 of the second surface is inclined and meets the axis A of the first surface in a point Z (see fig. 165). We assume that the elevation-plane of our drawing is parallel to the plane, which contains the axes A and A_2, and we assume also that the axis A of the first surface is vertical. The plan of the first surface is then a circle, and the plan of the second surface is an ellipsis which we have not drawn, as it would be useless for our purpose.

The reader will remember that the general method of finding the intersection of two surfaces consists in cutting both surfaces by a third of such a nature that its intersections can be readily found, and where these auxiliary intersections meet we have points of the required intersection of the two given surfaces. It is this general method we are going to apply.

It is evident that *any sphere* which has the point Z for centre will make circular sections in both surfaces of revolution, the elevations of these circles will be the straight lines C^v and $C^v{}_2$ which intersect in the point m^v. We know that m^v is the elevation of the points of intersection situated on the circular section C, we shall therefore find on C^h the points m^h plans of two points *m* of the intersection required. By repeating this operation with a series of spheres of different sizes we should get a series of points of the intersection. (See fig. 165.)

There is one sphere in particular which gives us important points of the curve of intersection, this is the sphere which cuts the first surface of revolution along its equator; for on the equator will be the points which separate on the plan

The Student's Column.

DESCRIPTIVE GEOMETRY.—PART II.

XVII.

Find a plane, P, *tangent to a surface of revolution and passing through a line,* D, *in space; also mark the point, m, where the plane* P *is tangent.*

THERE are only two planes which can satisfy this question, for this problem is equivalent to putting an egg between the two leaves of a portfolio. The egg is a surface of revolution, the back of the portfolio is the line D, and its sides are the two tangent planes.

As we know how to find the curve of contact of a cone with its vertex in a given point and tangent to a surface of revolution, we can select two points, *f* and *e*, on the line D; then construct the curves of contact for the cones which have the points *f* and *e* for vertices, and where these curves of contact intersect each other we shall have the points of contact *m* of the planes P. As this is doing fig. 154 twice over, we do not see any utility in the student making this drawing, as long as he has understood the method employed, which sketch fig. 162 will probably make sufficiently clear.

The same method, of course, extends to solving the above problem in the case of surfaces of the second degree generally, such as the ellipsoïd of fig. 158, or hyperboloïds and paraboloids, but there is a special surface of the second degree where the method of operating admits of great simplifications, and that is the *sphere*.

We assume that the centre of the sphere is placed in the plane of the plan; this means that the ground line L T passes through the centre O^v of the sphere's elevation. If from the point *d* foot of the line D we carry a series of tangents to the sphere, we know that the line of contact of the circumscribed cone formed by these tangents will be a circle contained in a plane perpendicular to the axis O*d* of the cone.

the seen from the unseen parts of the intersection. (See fig. 166.)

The tangent to the curve in any point is, as we know, the intersection of the two planes which are respectively tangent to each surface. In the points *l* of the equator, the planes tangent to the first surface are, at all events, vertical, and, as they contain the tangents to the curve, we can conclude that on the plan the tangent to the curve in the point *l* is also tangent to the equator; in other words, that the curve of the intersection is, as seen in the drawing, tangent to the equator. There is one exception possible to this law, for, if the tangent to the curve in a point *l* were a vertical line, then its plan would be a point. The curve in this case would touch the equator and *recoil* back, forming a sharp angle with itself instead of a continuous curve. Such a point of recoil can be seen on the elevation in the point k'', because the tangent to the intersection in this point is in our drawing perpendicular to the elevation; the hidden branch of the curve in this case is exactly covered by the seen branch. (See fig. 166.)

RECENT SALES OF PROPERTY.

ESTATE EXCHANGE REPORT.

SEPT. 8.

By TOWERS, WILLIAMSON, & ELLIS.

Bayswater—25, 25A, and 25B, Pickering-place, 20 years, ground-rent 6*l.* £550
Marylebone—7, Harcourt-street, and 13, Little Harcourt-street, 7 years, ground-rent 35*l.* 150

By FRANK JOLLY & Co.

Poplar—1, 3, 5, and 7, Southill-street, 69 years, ground-rent 8*l.* 645
Limehouse—32, 34, and 36, Clemence-street, 88 years, ground-rent 13*l.* 10s. 920

SEPT. 9.

By BLAKE & DANNATT.

Deptford—6, Strickland-street, 59 years, ground-rent 2*l.* 6s. 265
Greenwich, Humber-road—"Waverley House" and "Carlisle House," 97 years, ground-rent 14*l.* 14s. 700

By C. A. RICHARDS.

Eltham, Cross-lane—A Freehold Residence called "Park View" 500

By WALTON & LEE.

Bucks, Wraysbury—An Enclosure of Lammas Land, containing 5a. 1r. 10p., freehold 160

By R. & J. R. MITCHELL.

Cumberland, Egremont—The Calder Abbey Estate, containing 1,440 acres, freehold 44,200

SEPT. 10.

By HARMAN & MATTHEWS.

Old Kent-road—23, Glengall-road, 40 years, ground-rent 5*l.* 5s. 400
25, Glengall-road, 38 years, ground-rent 5*l.* 5s. ... 400

By J. P. LASH.

Stratford—69, Letts-road, 73 years, ground-rent 4*l.* 165
Poplar—431, East India Dock-road, 88 years, ground-rent 7*l.* 7s. 360

By EASTMAN BROS.

Anerley, Croydon-road—The Residence called "St. Aubyn's," 62 years, ground-rent 15*l.* 900

By C. G. COLES & Co.

St. John's Wood—4 and 6, Cochrane-street, 34 years, ground-rent 3*l.* 765
27, Cochrane-street, 34 years, ground-rent 1s. ... 455
72 and 74, Cochrane-street, 34 years, ground-rent 10*l.* 785
2, Blenheim-place, 35 years, no ground-rent 640
Barnes—2, Castelnau-gardens, 44 years, ground-rent 7*l.* 10s. 350

By SINCLAIR & SON.

Camberwell—45 and 47, Denman-road, freehold..... 860

Miscellanea.

Death of Mr. W. Nicholson, Leeds.—We regret to record the death of Mr. W. Nicholson, builder and contractor, of the old-established firm of William Nicholson & Sons, of South Brooke-street, Leeds. For some two or three years past he had not been enjoying his usual good health, but (with slight variations) had been able to give a constant supervision to the management of the business. At the time of his death (which occurred very suddenly) he was on a visit to the seaside with his family. Mr. Nicholson was one of the originators of the Leeds Master Builders' Association, and has been its President and held office as secretary and treasurer for more than twenty years. He was a member of the Council of the National Association of Master Builders of Great Britain, also a director of the Builders' Accident Insurance, since the formation of these institutions, and, as such, has been highly and deservedly respected by all who knew him. He was a member of the Leeds Town Council for some years. His death, at the comparatively early age of forty-nine years, is deeply regretted by all classes with whom he came in contact. His remains were interred at Woodhouse Cemetery, Leeds, on the 10th inst., in the presence of a large number of friends and work-people of the firm.

A Long-Span Bridge for India.—The Society of Engineers, under their President, Mr. Charles Gandon, paid a visit on Wednesday to the works of Messrs. Westwood & Baillie, at Poplar, to see the model, drawings, and portions of the work already executed of the great Sukkur Bridge across the Indus on the Afghanistan Frontier Railway, which branches off from the Kurrachee and Peshawur Railway. The bridge will be the largest in the Indian Empire, and surpassed by none in length of span, except the Tay Bridge now erecting over the Firth of Forth. The bridge is to be erected on the Rohri Pass side of the Bukken Island, across the water-way which separates that island from the main land. Across the other channel on the Sukkur side, a bridge of three spans, respectively 90 ft., 238 ft., and 278 ft., has already been erected. The bridge now under construction for the Indian Government has a single actual span of 900 ft. Of this, 350 ft. at each extremity are supported on cantilevers, and the 200 ft. central span is borne equally by the two terminal cantilevers. The actual width between the two faces of the land abutments is 820 ft., but there is a step back in each of 40 ft., which raises the full span to the 900 ft. above stated. The height of the towers is 169 ft. from their bases on the abutments. From the rear upright there projects diagonally, like the jib of a crane, an iron lattice shore, or support, 200 ft. long by 16 ft. 6 in. square in section, and weighing 225 tons. From a mass of plating embedded in masonry, and termed the anchor, a webbing of steel stretches from the ground over the top of the tower forward to the end of the cantilever, supporting, in tension like the chain of a suspension bridge, the overhanging weight of the cantilever. The two uprights are 123 ft. apart. Under the cantilever two booms, 6 ft. deep in structure, project from the abutments and strut the cantilever from below. The cantilevers are alike on both sides, as the bridge is perfectly straight from end to end. It is wholly composed of steel plates, some as much as 1¼ in. in thickness; and the total weight of the steel used in the construction will be 3,500 tons. The railway on the bridge is 18 ft. between the centres, and the portions between the rails are filled in with wood for the better footing for horses. The entire bridge will be put together and fitted in Messrs. Westwood & Baillie's yard, and the staging or scaffolding is being erected for that purpose, and will absorb no fewer than 2,000 loads of timber. The structure will thereafter be sent out, and will be erected on its future site by the Indian Government, under the superintendence of Mr. Robertson, who has been sent to this country in charge of the undertaking.

The School of Art Wood-Carving.—The School of Art Wood-Carving has been removed from the Royal Albert Hall to the Central Institution of the City and Guilds of London Technical Institute, Exhibition-road, South Kensington,—room No. 66 on the second floor,—where it has re-commenced work. Both day and evening classes are held in the school. There are at present twelve free studentships in the school, viz., six in the day classes and six in the evening classes, the fees for which are paid from funds supplied by the City and Guilds of London Institute for the Advancement of Technical Education. The holders of these studentships are selected by the Committee of the school from persons of the industrial class who are intending to earn their living by wood-carving. Candidates must have passed the second grade art-examination of the Science and Art Department in freehand drawing at least. Those who have some knowledge of wood-carving, or have passed in the other subjects of the second grade art certificate, or in drawing from the antique and the figure, architectural drawing, or designing, or in modelling, will be preferred. Applications for these studentships should be addressed to the Secretary at the school.

Schools, Old Kilpatrick, N.B.—At a meeting of the Old Kilpatrick School Board, held in their office on Saturday, the 12th inst., for the purpose of examining the competition plans sent in by various architects for the erection of the new school at Gavinburn, those prepared by Messrs. J. T. & R. Turnbull, joint architects, Glasgow, were approved of and accepted. The estimated cost is 3,500*l.* The clerk was instructed to forward the plans to Lord Blantyre for his approval, and to intimate acceptance to the architects.

Paris Exhibition, 1889.—The Lord Mayor received on Wednesday, at the Mansion House, M. J. Bourdais, architect to the French Government, and designer of the Trocadéro Palace in Paris; M. Ch. Devic, civil engineer, author of the scheme of the Universal and International Exhibition to be held at Courbevoie, near Paris, in 1889; and M. Louis, head of the Foreign Department of the Committee to examine and report upon the scheme. The deputation, who were introduced by Mr. Campbell Robertson, informed his Lordship that their plans will be laid before the French Chambers on their re-assembling after the coming General Election. The undertaking will be entirely self-supporting, and no financial support will be asked either of the French Government or of the Paris Municipality. They further stated that the proposed plans will remove all cause of complaint for want of space, which was a most serious grievance of the Foreign Commissioners in 1878. In point of fact, the proposed Palace at Courbevoie will offer an almost unlimited space to exhibitors, the preparatory plans, drawn up by M. Jules Bourdais, covering an area of more than 500 acres of land. The promoters of the scheme, who are receiving large support in France, have come to London to enlist the sympathies of intending English exhibitors.—*Standard.*

Tramway Employes at Birmingham.—Mr. E. Pritchard, C.E., the chairman of the Aston Tramways Company, on Sunday, on the occasion of a breakfast given by the Central Tramway Company to their workpeople, stated that the directors of the Birmingham and Aston Company had for the last few weeks had under consideration the best means to be adopted whereby the present long working hours of the engine drivers, guards, and other persons engaged could be reduced, and at the last outing to the *employés* given by the company definite instructions were given to the secretary and manager, Mr. Bartley, to submit at an early date for the consideration of the directors a workable scheme whereby the hours of labour might be reduced from fifteen to twelve hours each day without reducing the amount of wages at present paid by the company. Such scheme has now been submitted, and at a meeting of the directors held on Monday it was, upon the motion of the Chairman, unanimously adopted, and instructions given to put the same in force as soon as relief drivers, guards, and other officials could be secured.

Opening of a Board School.—A new Board school was opened at Denmark-street, Plaistow, last week. The site of the school forms part of 6¼ acres of land bequeathed by Nicholas Avenon, a merchant tailor of London, A.D. 1580, to the parish of West Ham, on the condition that twenty-four poor persons should receive at the parish church "one penny loaf" upon every Sabbath day, the residue of the rent of the land, if any, to be paid to the vicar for a sermon to be preached by him once every year. The School Board purchased the site for 1,500*l.* The site, the construction, and the furniture have cost about 12,300*l.*, or, the capacity being for 1,272 children, about 9*l.* 13s. 3d. per head. The architect is Mr. S. J. Newman, of Fenchurch-street. The builder is Mr. J. G. Borlock; Messrs. Jukes & Co., Bromley, supplied the ironwork; Mr. Adams fitted all the window openings with his patent fasteners, &c.; Mr. Brown, Broad-street, supplied the red moulded bricks for strings and cornices, &c.; and Messrs. S. Trickett & Son supplied the Greenhill stone.

New Theatre for Oxford.—A site for a new theatre has been obtained in George-street, and is being rapidly cleared for the erection of the new building, which, it is expected, will be ready for use at the beginning of next year. The plans, which have been prepared by Mr. H. G. W. Drinkwater, F.R.I.B.A., were approved by the Local Board at their last meeting, and the carrying out of the work has been entrusted to Messrs. Wilkins & Son. The building will accommodate nearly a thousand people.

Carbolineum Avenarius.—In reference to our comment on this protective solution in a recent "Note," the patentees affirm that though wood coated with this substance might be more inflammable when newly coated, it is not so when the *Carbolineum* has had time to dry well into the wood. It is fair to say that our opinion was based on experiments with wood newly coated, and our readers may take the opinion of the patentees *per contra* for what they think it is worth.

A Monster Water Meter.—There has lately been set up at the Corporation depôt, Audley, a novel kind of meter for measuring the water supplied to the Leeds and Liverpool Canal by the Blackburn Water Committee. The water is conveyed from the old gathering ground to the Audley depôt in a 12-in. pipe, which empties itself into a small tank at the side of the canal. The measurer, which is self-acting, has been specially designed by the Borough and Water Engineer (Mr. McCallum), and consists of a twin-tumbler or double-tipping tank, which works with a see-saw motion. The tumbler works underneath a weir (which affords the water an outlet from the above-mentioned tank), and it is so shaped and balanced that when one compartment is full, the weight of the water causes it to tip over and discharge; the other compartment then immediately begins to fill. This action continues as long as the water is being discharged into the canal, both sides filling and emptying alternately. Each compartment holds 100 gallons, and the quantity of water measured is registered by means of a train of wheels and pinions (with dials) worked by an eccentric on the shaft of the tumbler and a ratchet. As the weight of water at each tip is considerable, two gun-metal hydraulic buffers of novel design are fixed at each side, so arranged as to let the tumbler fall gently when once it has begun to tip. At the suggestion of the Chief Engineer to the Canal Company (Mr. Chas. White, C.E.) appliances have been constructed to break the force of the water over the weir prior to its entrance into the tumbler, and also to ensure uniformity of flow throughout the length of weir. The tumbler is enclosed on three sides by concrete, and the indicator is raised on posts for convenience of reading. The tumbler is made of sheet iron, and has been made and fitted by the Corporation workmen. The hydraulic buffers, brasses, &c., have been supplied by Messrs. T. Winter & Co., of Blackburn.

Railways in the Cape Colony.—By the opening, last month, of the last section of the Eastern Railway System of the Cape of Good Hope, which has reached its terminus at Aliwal North, the entire railway system of the colony authorised to be constructed by acts of the local parliament is completed, with the one exception of the extension of the Western line to Kimberley (Diamond Fields), the work of which is now being actively carried on, and will very shortly be concluded. The three railway systems, Western, Midland, and Eastern, comprise in all 1,367 miles, and if to this total be added the few loop lines, such as the junctions to King William's Town, to Graham's Town, to Malmsbury, and to Colesberg, and the private company's line from Port Alfred to Graham's Town, it is found that the colony has now actually in working order an extent of 1,562 miles of lines, representing an outlay of 14,388,600*l.* The Kimberley extension, about 80 miles, the probable cost of which is 400,000*l.*, will bring the total length of railways in the colony to 1,662 miles, at an expenditure of 14,788,600*l.* During the first six months of this year the railways of the colony have yielded returns sufficient to pay all maintenance and working expenses, and left a surplus of nearly 3¼ per cent. towards payment of interest on the capital expended for construction.—*Iron.*

PRICES CURRENT OF MATERIALS.

TIMBER.	£. s. d.	£. s. d.
Greenheart, B.G. ....ton	6 10 0	7 10 0
Teak, E.I. ....load	12 10 0	15 10 0
Sequois, U.S. ....ft. cube	0 2 6	0 2 9
Ash, Canada ....load	3 0 0	5 0 0
Birch ,, ...	3 0 0	4 10 0
Elm ,, ...	3 10 0	5 0 0
Fir, Dantsic, &c.	1 10 0	4 10 0
,, Canada	3 0 0	5 0 0
Pine ,, red	6 0 0	7 0 0
,, yellow	3 0 0	4 0 0
Lath, Dantsic ....fathom	3 15 0	5 5 0
St. Petersburg	5 0 0	6 0 0
Wainscot, Riga....log	5 0 0	7 0 0
Deals, Finland, 2nd and 1st...std. 100	3 0 0	4 10 0
,, 4th and 3rd	8 0 0	9 0 0
Riga	6 10 0	7 10 0
St. Petersburg, 1st yel.	7 0 0	8 10 0
,, 2nd ,, ...	10 0 0	17 0 0
,, white	8 0 0	9 15 0
Swedish	6 10 0	11 0 0
White Sea	7 0 0	17 0 0
Canada, Pine 1st	8 10 0	19 0 0
,, 2nd	18 0 0	32 10 0
,, 3rd, &c.	12 0 0	18 10 0
,, Spruce 1st	7 0 0	10 10 0
,, 3rd and 2nd	9 0 0	12 0 0
New Brunswick, &c....	6 10 0	8 0 0
Battens, all kinds	5 0 0	7 10 0
	4 0 0	13 0 0

TIMBER (*continued*).	£. s. d.	£. s. d.
Flooring Boards, sq. 1 in.—Prepared, first	0 9 0	0 13 0
Second	0 7 6	0 8 6
Other qualities	0 5 0	0 7 0
Cedar, Cuba....foot	0 0 3½	0 0 4
Honduras, &c.	0 0 3	0 0 4
Australian	0 0 3	0 0 3½
Mahogany, Cuba	0 0 5	0 0 7½
St. Domingo cargo av.	0 0 5½	0 0 7½
Mexican ,, ...	0 0 4	0 0 5
Tobasco ,, ...	0 0 4	0 0 6½
Honduras ,, ...	0 0 4½	0 0 6½
Rose, Rio ....ton	7 0 0	17 0 0
Bahia....	6 0 0	15 0 0
Satin, St. Domingo .... ft.	0 0 8	0 1 0
Porto Rico	0 0 8	0 1 3
Walnut, Italian	0 0 4	0 0 5
METALS.		
IRON—Pig in Scotland ....ton	2 1 6	0 0 0
Bar, Welsh, in London....	4 15 0	5 2 6
,, ,, in Wales	4 7 6	4 12 6
,, Staffordshire, London	6 0 0	7 0 0
Sheets, single, in London....	7 10 0	9 0 0
Hoops ,, ...	6 10 0	7 10 0
Nail-rods ,, ...	6 0 0	7 0 0
COPPER—		
British, cke. and ingt. ....ton	45 0 0	46 10 0
Best selected	46 10 0	47 10 0
Sheets, strong....	55 10 0	56 0 0
,, India	52 0 0	53 0 0
Australian, fine cash....	0 0 0	0 0 0
Chili, bars ,, ...	41 12 6	42 5 0

METALS (*continued*).	£. s. d.	£. s. d.
YELLOW METAL....lb.	0 0 4½	0 0 4½
LEAD—Pig, Spanish	11 1 3	0 0 0
English, com. brands	11 10 0	0 0 0
SPELTER—		
Silesian, special ....ton	14 10 0	14 12 6
Ordinary brands	14 7 6	14 10 0
TIN—		
Straits	91 0 0	91 10 0
Australian	91 2 6	91 12 6
English ingots....	93 0 0	0 0 0
TINPLATES—		
IC coke ....box	14 6 0	16 6 0
IX ditto	21 0 0	25 0 0
IC charcoal	17 0 0	20 0 0
IX ditto	26 0 0	27 0 0
OILS.		
Linseed ....ton	22 10 0	23 0 0
Cocoanut, Cochin	31 10 0	32 0 0
Ceylon	27 0 0	0 0 0
Copra....	26 0 0	26 10 0
Palm, Lagos	30 0 0	0 0 0
Palm-nut Kernel	26 0 0	0 0 0
Rapeseed, English pale....	25 15 0	0 0 0
,, brown	23 0 0	0 0 0
Cottonseed, refined	21 5 0	23 0 0
Tallow and Oleine	25 0 0	45 0 0
Lubricating, U.S.	7 0 0	10 0 0
,, Refined	8 0 0	15 0 0
TURPENTINE—		
American, in cks. ....cwt.	1 5 6	1 6 0
TAR—Stockholm ....brl.	0 19 6	1 0 0
Archangel....	0 11 0	0 11 6

COMPETITIONS, CONTRACTS, & PUBLIC APPOINTMENTS.

Epitome of Advertisements in this Number.

COMPETITIONS.

Nature of Work.	By whom required.	Premium.	Designs to be delivered.	Page.
Design for a Vlila Residence	R. H. Smith	10*l.*....	Not stated	ii.

CONTRACTS.

Nature of Work, or Materials.	By whom required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.	Page.
Renewing Water Mains, &c., Aldershot....	War Department....	*Official*	Sept. 22nd	ii.
Kerbing, Paving, &c., and Making-up Road...	Tottenham Local Board	— De Pape	do.	ii.
Concrete Invert within Sewage Works	do.	do.	do.	ii.
Well-Sinking	do.	do.	do.	ii.
Guernsey Granite and Pipe Sewer, &c.	Willesden Local Board	O. Claude Robson	do.	ii.
Granite Macadam	Staines Local Board ...	*Official*	Sept. 23rd	ii.
Broken Granite and Kentish Flints....	Twickenham Local Brd.	do.	Sept. 24th	xviii.
Scavengers' Depot....	Com. of Sewers....	do.	Sept. 25th	ii.
Brick and Pipe Sewer	Lowestoft Impr. Com.	R. H. Inch....	Sept. 28th	ii.
Painting Barracks, &c., Halifax	War Department....	*Official*	do.	ii.
Road-making	United Land Co. Lim.	do.	do.	ii.
Making-up Roads, &c....	Wandsworth Bd. of Wks	*Official*	Sept. 29th	xviii.
Sewerage Works	Hereford Town Council	J. Parker	do.	ii.
Forming Roads, &c., Garratt-lane	Wandsworth & Clapham Union	T. W. Aldwinckle	October 1st	xviii.
Cottages, Roads, Drainage, &c.	Sheerness Permanent Benefit Building Soc.	*Official*	do.	xviii.
Broken Gradite	Bishop's Stortford L. B.	do.	do.	ii.
Water Works, Highbridge....	Axbridge R. S. A.	A. Woodhouse	October 4th	ii.
Stores	Great Western Ry. Co.	*Official*	October 5th	ii.
Wood Blocks for Paving	Ipswich Sanitary Auth.	E. Buckham	October 8th	ii.
Concrete Sea-Wall and Promenade	Hartlepool Corporation	H. Mair	October 28th	ii.

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in.	Page.
Engineering Draughtsman	Belfast Town Council...	156*l.*	Sept. 23rd	
Clerk of Works	Acton Local Board	2*l.* 10s. per week ...	Not stated	xvi.

TENDERS.

BROMLEY (Kent).—For making up Lower Camden-road, for the Bromley Local Board. Mr. Hugh S. Cregeen, surveyor :—

John Mowlem & Co.	£1,378 0 0
James Hare	1,275 0 0
Thomas Lansbury	1,247 10 0
Edwin Peill & Sons (accepted)	1,169 0 0

BROMLEY (Kent).—For making up private road belonging to the South-Eastern Railway Company, for the Bromley Local Board. Mr. Hugh S. Cregeen, surveyor :—

James Hare	£375 0 0
John Mowlem & Co.	222 0 0
Edwin Peill	211 0 0
Thomas Lansbury (accepted)	160 0 0

COLCHESTER.—For the erection of villa residences, Wellesley-road, Colchester, for Mr. Bouttell. Mr. G. H. Page, architect, Trinity Chambers, Colchester :—

G. Bowles (accepted)....	£650 0 0

[No competition.]

COLEFORD (Gloucestershire).—For erection of new south transept to St. John's Church, Coleford. Mr. S. Gambier Parry, architect :—

Wall & Hook, Brimscombe (accepted)	£530 0 0

GEDLING (Notts).—For a pair of villa residences, for Mr. W. A. B. Salisbury. Mr. W. H. Radford, architect, Nottingham :—

J. Hutchinson, Nottingham....	£770 0 0
Thos. Caunt, Carrington	758 0 0
Wm. Baynes, Nottingham	668 0 0
F. Wartnaby, Nottingham	635 0 0
G. Pillatt, Nottingham	623 0 0
Smith & Bellamy, Gedling	620 0 0
Wooll Bros., Nottingham (accepted)..	605 0 0

HULL.—For new market, &c., for the Corporation of Hull. Mr. W. Alfred Gelder, architect. Quantities by architect :—

Armitage & Hodgson, Leeds	£19,627 0 0
Simpson & Malone, Hull	19,510 16 1
Vernon & Co., London....	19,149 1 9
M. Harper, Hull....	18,821 0 0
F. Blackburn, Hull	18,816 0 0
Ives & Co., Shipley	18,750 0 0
Jackson & Son, Hull....	18,720 0 0
A. W. Stanley, Hull	18,633 0 0
T. Goates, Hull	18,456 0 0
Hockney & Liggins, Hull....	18,289 0 0
R. W. Richardson, Hull	17,922 14 0
B. Musgrave, Hull	17,775 0 0
John Drury, Hull (accepted)....	17,610 0 0
Iron Roof.	
Newton, Chambers, & Co., Sheffield	£3,024 0 0
Butler & Co., Leeds	2,970 0 0
Head, Wrightson, & Co., Stockton ..	2,785 0 0
Handysides & Co., Derby	2,641 0 0

HIGHGATE.—For alterations and additions to two shops in the Archway-road, Highgate. Mr. Wm. Smith, architect. No quantities:—

J. O. Richardson, Albert Works, Peckham *	£478 0 0

* Revised estimate accepted.

HYDE (Hants).—For repairs to church roof, Hyde, near Fordingbridge, Hants. Mr. Robt. J. Beale, architect, Palace Chambers, Bridge-street, Westminster:—

C. Mitchell, Woodfalls, Salisbury *	£114 10 0

* Accepted.

KILBURN.—For the erection of shop and dwelling-house in High-road, Kilburn, for Mr. Geo. Skinner. Mr. Edwd. Monson, jun., architect, Acton:—

J. Lord, Chelsea (accepted)	£891 0 0

KILBURN.—For alterations and additions at Kilburn, for Mr. E. Bowman. Mr. C. H. Th mas, architect:—

Stevens	£470 0 0
W. & D. Macgregor	468 0 0
F. Mark	348 0 0
J. O. Richardson	344 0 0

LONDON.—For erecting an eight-cell destructor and chimney-shaft, 180 ft. high, and works in connexion therewith, in Wentworth-street and George-yard, for the Whitechapel District Board of Works, from plans by Mr. W. La Rivière, architect and surveyor to the Board, Great Alie-street. Quantities by Mr. R. W. Hobden, Devonshire-street:—

For the Ironwork, including Royalty on use of Patents.

Manlove, Allict, & Fryers	£2,280 0 0

For the whole of the Brickwork, Masonry, and other work, exclusive of the Foundations of the Shaft, which is being done by the Board.

Bentley	£4,792 0 0
Chappell	4,600 0 0
Greenwood	4,546 0 0
Brass	4,443 0 0
Nightingale	4,354 0 0
Morter	4,100 0 0
Dove	4,100 0 0
Rider	4,038 0 0
Smart	3,990 0 0
Mowland	3,973 0 0
Perry	3,947 0 0
Gentry	3,896 0 0
Ashby & Horner	3 847 0 0
Little	3,766 0 0
Pritchard	3,697 0 0
B. Cook & Sons	3,591 0 0

LONDON.—For Stephen the Yeoman Ragged Schools. Mr. James Clench, architect and surveyor:—

J. Reynolds	£1,398 0 0
Roberts	1,376 0 0
S. Chafen	1,200 0 0
Scofield	1,198 0 0
Tyler	1,197 0 0
Jones & Co.	1,190 0 0
R. Eldridge	1,125 0 0
B. Wells	1,119 0 0
Buller	1,100 0 0
Lindfield	1,095 0 0
W. & F. Croaker	1,078 0 0
Ridout	1,047 10 0
Sabey & Son	1,044 0 0
J. Angood	1,020 0 0
H. R. Swain	1,020 0 0
J. Wood & Co.	1,009 0 0
W. & H. Castle	1,013 0 0
Pack Bros.	990 0 0
Balaam Bros. (accepted)	956 0 0
Cuming & Barnet	919 19 0

LONDON.—For the erection and completion of a stable and coach-house, Lodge-road, St. John's Wood, for Capt. Hamilton. Mr. Walter Graves, architect. Quantities by Mr. H. E. Pollard:—

Burdett & Sons	£750 0 0
Langridge & Son	680 0 0
Wall Bros.	646 0 0
Stimpson & Co.	638 0 0
Vears & Co.	582 0 0
Ward & Lamble	549 0 0
J. O. Richardson	525 0 0

LONDON. — For works at No. 45, York-terrace, Regent's Park, for Mr. L. Zossenheim. Mr. Thomas Durrans, architect:—

Druce & Co.	£545 0 0
C. Hindley & Sons	504 0 0
Marks	493 0 0
Foxley	490 10 0
Maple & Co.	450 0 0
Wilkinson & Son	429 10 0

LONDON.—For a new photographic studio for Messrs. Brown, Barnes, & Bell, at No. 12, Baker-street. Messrs. New & Son, architects:—

Drew & Cadman	£315 0 0
Kinninmont & Son	279 0 0
Thomas & Butland	260 0 0
Hatfield & Son	245 0 0
George Foxley (accepted)	219 10 0

SPALDING.—For the erection of a nag stable, &c., on Mr. Samuel Campain's Farm, Deeping St. Nicholas, for the Right. Hon. Lord Carrington. Mr. J. Carter Jonas, surveyor, Cambridge:—

Watson	£123 0 0
Thos. Pick	111 17 0
J. Moore, jun.	100 0 0

SPITALFIELDS.—For new rag warehouse, Fashion-street, Spitalfields. Mr. Andrew Edwards, architect:—

Jas. Howlett, Limehouse (accepted)	£426 10 0

WOLVERHAMPTON.—For the erection of Wolverhampton Chapel and Class-room. Mr. Charles Bell, architect. Quantities by Mr. Henry Lovegrove:—

	Chapel.	Class-room.
Ham	£2,578 0 0	£412 0 0
Wellings	2,118 0 0	447 0 0
Davis	1,860 0 0	535 0 0
Moss	1,800 0 0	400 0 0
Horsman	1,694 0 0	366 0 0
Tyldesly	1,690 0 0	350 0 0
Lynex	1,649 0 0	347 0 0
Bradney	1,588 0 0	344 0 0
Gough	1,460 0 0	322 0 0

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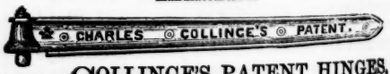

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